

CONFERENCE PROCEEDINGS

RAND

The Future of the Information Revolution in Europe:

Proceedings of an International Conference

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*Richard O. Hundley, Robert H. Anderson,
Tora K. Bikson, Maarten Botterman,
Jonathan Cave, C. Richard Neu,
Michelle Norgate, and Renée Cordes*

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Preface

The National Intelligence Council (NIC) is undertaking a systematic research and development program on broad, crosscutting issues for the next millennium; this constitutes the DCI's Strategic Estimates Program. One of these strategic estimates focuses on developing a better understanding of the future course of the information revolution throughout the world over the next 10-20 years.

The NIC has asked RAND to take the lead in this effort to chart the future course of the information revolution. As a major part of this effort, RAND is convening a series of international conferences on various aspects of the information revolution. The first of these conferences, focusing on societal trends driven by the information revolution, as they are unfolding in different areas of the world, was held in Washington, D.C., in November 1999. The proceedings of this conference were published in Hundley et al (2000). The second conference in the series, focused on the technology drivers of the information revolution, was held in Pittsburgh, Pennsylvania, in May 2000. The proceedings of that conference were published in Anderson et al (2000). The third conference in the series, focused on the information revolution in Latin America, was held in Washington, D.C., in November 2000. The proceedings of that conference were published in Treverton and Mizell (2001).

The fourth conference in this series, focused on the information revolution in Europe, was held in Limelette, Belgium, in April 2001. This report contains the proceedings of this fourth conference, which was cosponsored by the National Intelligence Council (United States), the Defence Evaluation and Research Agency (United Kingdom), and the International Relations and Security Network (Switzerland).

Regarding the authors: Robert H. Anderson, Tora K. Bikson, Richard O. Hundley, and C. Richard Neu are staff members of RAND based in Santa Monica, California; Maarten Botterman and Jonathan Cave are staff members of RAND Europe based in Leiden, The Netherlands; Michelle Norgate is a staff member of the International Relations and Security Network based in Zurich, Switzerland; and Renée Cordes is a free lance journalist based in Brussels, Belgium and working under contract to RAND Europe.

This research is sponsored by the National Intelligence Council, and monitored by the National Intelligence Officer (NIO) for Science and Technology. It is being

conducted by the Acquisition and Technology Policy Center of RAND's National Defense Research Institute (NDRI). NDRI is a federally funded research and development center sponsored by the Office of the Secretary of Defense, the Joint Staff, the defense agencies, and the unified commands.

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Summary

The information revolution is bringing about profound changes in many aspects of life. RAND has undertaken a multi-year effort, sponsored by the National Intelligence Council (NIC), to chart the future course of these changes all over the world. As a major part of this effort, RAND is holding a series of international conferences on various aspects of the information revolution.

The fourth conference in this series, cosponsored by the NIC (United States), the Defence Evaluation and Research Agency (United Kingdom), and the International Relations and Security Network (Switzerland), is reported on here. It was held in Limelette, Belgium, in April 2001 and focused on the information revolution in Europe. Its objective was to gain an European perspective on all aspects of the information revolution.

The Technology Dimension of the Information Revolution

Regarding the technology arena, the European view of the information revolution is similar to the American view, as elucidated during an earlier conference in this series.¹ Similar, but not identical. The Europeans place much more emphasis on wireless technology, as enabling mobile gateways to the Internet and as an area where they feel they are currently in the lead. The details of this European view of technology are presented in Section 3.

The "Climate" in Which the Information Revolution Is Developing

While the technology underpinnings are largely the same, the social, political, and economic "climate" in which the information revolution is developing in Europe differs in important ways from that in America:²

Differing European and American Approaches to Economic and Social Change.

Economic and social change seems to come easier in America than in Europe, sometimes much easier. This was repeatedly emphasized during the conference

¹ See Anderson (2000) for the results of this previous conference.

² This summary description of the social, political, and economic "climate" in Europe necessarily oversimplifies for purposes of brevity the nuanced discussion of the many "climatic" variations occurring across Europe that is contained throughout these conference proceedings.

discussions. As individuals, Europeans are on average much more risk-averse than are Americans when it comes to economic change. As a society, Europe is generally distrustful of major economic or social changes. As a result, many more obstacles to change have arisen in Europe than in America, including a financial sector that is less supportive of small start-up companies.

The Greater Importance Europeans Attach to Economic and Social Equity.

Another key difference between Europe and America emphasized in the conference discussions is the much greater importance Europeans attach to economic and social equity. Europeans place a much greater value on equality of outcomes than do Americans, who value equality of opportunity rather than outcomes and are more accepting of "winner takes all" situations. This greater European concern for economic and social equity may be inconsistent with the large rewards often associated with successful risk-taking in dynamic business sectors.

The European Desire for "Convergence." Closely related to the European desire for economic and social equity is a desire for "convergence" among the countries of Europe, where by convergence is meant the reduction of differences in economic prosperity among the various European nations – including those not yet admitted to the European Union (EU). This is another area where America clearly differs from Europe. Most American states don't want to "converge" with other states; they want to get ahead of those states.

Some conference participants, Europeans as well as Americans, wondered if the pursuit of economic convergence is consistent with full exploitation of the opportunities afforded by the new information technologies.

Differing Trade-Offs between Market Forces and Government Policies. Europe and America take differing approaches to balancing these factors: the U.S. gives market forces more of a free rein; Europe leans harder on government policy to produce socially desirable ends. This is clearly related to the U.S. emphasis on economic efficiency versus the European emphasis on economic and social equity.

A Greater European Emphasis on Top-Down Planning. Closely related to this is a greater European emphasis on top-down planning, by governmental and business elites (often working in close conjunction), both on a national basis and by the EU. The U.S. relies much more on bottom-up, market-driven, private-sector planning, with the government role limited to preparing the "playing field" and providing "ground rules" for competition and innovation, but not trying to second-guess where the breakthroughs and developments will occur.

The European Emphasis on "Sustainability." A recurring theme among the European participants in the conference was the question of "sustainability": whether the information revolution will hinder or enhance sustainable – in environmental and economic terms – development. No consensus was reached on this question. Nevertheless, the European participants attached considerable importance to achieving sustainable development. They acknowledged, however, that such a future is unlikely to come about without significant intervention by governments and other agents of stability and social change.

This appeared to the American participants to be almost exclusively a European concern; sustainability insofar as the information revolution is concerned certainly is not a major concern today in America.³

These "climatic differences" between Europe and America are discussed in more detail throughout these conference proceedings.

The Course of the Information Revolution in Europe

As a result of this different "climate," the information revolution is following a somewhat different course in Europe than in America:

- Since substantial change in the patterns of economic activity is required to take full advantage of the new information technologies, with new companies arising and some old companies falling by the wayside, with new jobs appearing on the scene and some old jobs disappearing, the differing European and American attitudes towards such change could be quite consequential. In particular, as noted several times during the conference, the process of "creative destruction" by which new technologies and business paradigms replace their predecessors as the information revolution progresses is likely to proceed more slowly in Europe than in the United States.
- The "winner takes all" mentality in the U.S. has led to a very aggressive pursuit of new IT-related business opportunities, particularly by small, start-up companies financed initially by venture capital. The European economic-and-social-equity emphasis is leading to a more subdued approach to these same opportunities in much of Europe.⁴

³ This was the first time the topic of "sustainability" has come up in the RAND series of international conferences on the information revolution.

⁴ In much, but not all of Europe. During the 1990s, for example, there was an explosion of start-up IT companies in Sweden and Finland.

- The “top-down” planning mentality in Europe, with governments playing a major role, reinforces this slower approach, since deliberate, top-down planning almost always takes longer, particularly when governments are involved.
- As a corollary to all of the above, when a new technology opportunity or economic arrangement manifests itself, the American approach is to try it out and see what happens. The European approach is to first assess the likely consequences, to make sure nothing bad – or at least not too bad – will happen, before trying it out.

All of this means that up to now the information revolution has been proceeding slower in Europe than in America, with the U.S. in the vanguard in most IT-related areas and Europe following along somewhat behind. This is likely to continue for at least the next few years, if not longer, Europe’s current lead in wireless telephony notwithstanding.⁵

The economic and business aspects of this course that Europe is following are discussed in Section 4, the social aspects in Section 5, and the governmental and political aspects in Section 6. Sections 8 and 9 explore differences between Europe and America and within Europe itself in somewhat greater depth.

Will, or Must, Europe Become More Like America

Given all of these differences between Europe and America, what does the future hold? Driven by the forces of the information revolution and globalization, will Europe become more like America? In order to succeed in the information age, must Europe become more like America? There was no consensus on these questions among the conference participants, European or American.

Some participants – notably some European participants – felt that although Europe is and will likely remain attached to the ideals of social equity and inter-European convergence, influences already afoot will inevitably make Europe more like America: more tolerant of disparities in income and wealth within

⁵ Europe’s current lead in wireless technologies received considerable emphasis during the conference. Many Europeans are counting on this to give Europe an edge in the next set of information society developments. Whether this will turn out to be true remains to be seen, particularly in view of the market uncertainties and financial difficulties currently facing the leading European wireless/telecommunications companies attempting to exploit this lead.

These uncertainties and difficulties also received considerable emphasis during the conference. Simply put, the market projections for third-generation mobile telephony (so-called 3G) may be considerably overblown, and the European telecommunications companies may have overpaid for their 3G licenses. Only time will tell.

nations and more realistic about the fact that all nations cannot achieve similar rates of economic development. The completion of the European market will increase competition within Europe.⁶ The EU Stability Pact will limit government deficits, and competition for employment and investment will restrain taxation. EU enlargement will only heighten this competition. Similarly, adoption of a common currency will speed the integration of European financial markets and intensify competition for investment.

In this view, the result of these forces will be to limit the capacity of European governments to pursue social equality. Although European governments will remain "officially" committed to equality of outcome among their citizens, the "reality" will be increasingly laissez-faire policies that will accelerate the incentives for and increase the rewards of successful exploitation of information technology. In short, Europe will become more like America.⁷

Other participants strongly rejected this view, warning against generalizations that suggest that Europe shares a single approach to preserving social equity. In fact, they said, there are many social-economic models within Europe, and some of them, at least, will prove able to withstand the American challenge.⁸ In their view, Europe will be able to maintain its cherished differences.

The Security Dimension of the Information Revolution

The conference also discussed the security dimension of the information revolution.⁹ These discussions focused primarily on the conflict between the

⁶ "Completion of the European market" is a phase that is commonly applied (in Europe) to a constellation of public- and private-sector actions that will eventually result in the EU becoming a single market — for goods, services, labor, and finance. Most official barriers to the flow of goods, services, and labor within the EU were eliminated in 1992. The fixing of exchange rates in 1998 removed further barriers to intra-European transactions. The imminent arrival of the Euro currency will be yet another step in this direction. European governments continue to harmonize national policies to make commerce and finance increasingly borderless. And private companies are gradually realigning and relocating operations to take advantage of the opportunities afforded by the expanded European market. The full implications of economic and financial liberalization that has swept Europe in recent years have not yet been felt, and it is in this sense that the single European market is not yet "complete."

⁷ As an extension of this view, some participants pointed out that the generation that will do the most to shape the course of the information revolution in Europe — today's young people — was not represented at this conference. Conference participants, they asserted, know little about the attitudes of young people towards information technology, work, or society. They speculated that members of the younger generation of Europeans will become (or already are) more like their American contemporaries than their elders are or will be.

⁸ As an extension of this view, many conference participants believe that although IT will increase homogeneity within Europe and between it and other developed nations in some respects, it will enhance heterogeneity in others (e.g., harmonized laws but mass customization).

⁹ By "security" we mean here security threats to IT systems and, more broadly, the security of human activities being carried out on the Internet or elsewhere in cyberspace.

need to police the Internet to detect crimes and users' simultaneous demand for privacy; on the extent to which businesses are aware of security risks; and on the effectiveness of national and international laws regarding cyber crime. In this arena, the view from Europe is quite similar to the view from America, and not much has changed since the RAND-Ditchley conference on Security in Cyberspace in 1996.¹⁰ Among the major points made during the security discussions at this 2001 conference were the following:

The Conflicting Desires for Security, Privacy, Openness, and Functionality.

There is a fundamental conflict on the part of Internet users between their desire for security and privacy on the one hand, and their desire for openness – i.e., open access to (most) things on the Internet – and functionality on the other. These conflicting desires have been an impediment to improving IT-related security in the past, and continue to be an impediment today.

National and International Laws. International and national laws (for example, those of the U.S., the EU, and Switzerland) regarding activities in cyberspace are incompatible today and must be considered a potential factor in impeding security and destroying confidence among Internet users. Conference participants pointed out that although laws and regulations can be imposed indirectly, companies and individuals also need to take responsibility for protecting themselves. We should not count on government officials to create laws at the same time as technological advances emerge. Rather, laws are by nature always made after the arrival and implementation of new technological developments.

Policing versus Privacy. There is an unresolved conflict between Internet users' demands for privacy and the simultaneous need of police to monitor Internet service providers (ISPs) to gather evidence against criminals. Police want their own secure system, but they also want access to information posted on the Internet or read by (potential) criminals. In other words, police want the keys but do not want others to have them also. Individuals and business, on the other hand, want the privacy of their own activities protected and, in many areas of the world, do not trust the police to protect that privacy. Conference participants felt there can be no easy solution to this conundrum.

IT Security in Business. Conference participants agreed that security is not solely a technical problem. Some good technological solutions are available, but many IT systems are not using such solutions. Security is often not seen as a serious concern by many users. As a further complication, the sharing of information,

¹⁰ See Hundley et al (1996) for the proceedings of this conference.

especially information relating to security, is inhibited due to companies' fears that their vulnerabilities may be exposed. Participants agreed that increased sharing of security-related information is vital, and explored the issue of how this fear of exposure can be overcome. They also agreed, however, that getting companies to collaborate, getting information from them, and assessing damage done to them remains problematic.

Future Developments. Conference participants noted that Asia, sub-Saharan Africa, and South America will have a huge effect on the Internet when they come online fully in the near future. They are looking to the Western world, hoping to share our experience and hoping for help with good practice. We need to consider what our (North America's and Europe's) advice to them will be, on security and on other Internet-related issues.

Participants also noted that while the use of IT in the European public sector is widespread today, it is often difficult to find security experts for the public sector, since wages are usually lower than in the private sector. In addition, the migration of qualified specialists from east to west and south to north in Europe is causing problems.

Finally, participants also agreed that the focus now should be on building trust in software security systems. Security was once costly, cumbersome, and/or impractical, but this is no longer true. We now need to change people's attitudes, so they recognize that security is part of overall quality. It might be time that data protection becomes an essential legal requirement for organizations maintaining data bases containing information on individuals.

Further details regarding this European view of security are presented in Section 7.

Some Secrets of Success in the Information Age

The conference discussions highlighted four items as being among the "secrets of success" for a nation in the information age:

- Bandwidth per capita.
- Venture capital as a proportion of GDP.
- A competitive environment (i.e., open markets and deregulation) as a force for change.
- A quality education for all.

These four factors should have both predictive utility and policy implications, not only for Europe but for all other nations as well.¹¹

Europe's View of the "Dark Side"

The U.S. dominance of the information revolution was brought up frequently during the conference. Many instances of this dominance were cited, including U.S. control of the development of the Internet, the procedures for assignment of Internet domain names, and Hollywood's dominance of film and television entertainment, with its effect on European and other non-U.S. cultures.

Directly related to this U.S. dominance were issues of trust in and dependence on the U.S. – in European eyes, too much need for trust, and too much dependence. According to conference participants, many Europeans are worried about their increasing need to trust information systems built (or integrated) in the United States on which their business and governmental operations and critical infrastructures depend. Europeans wonder if deliberate security "back doors" or flaws are inserted into these U.S.-supplied information systems to facilitate U.S. governmental and commercial intelligence collection.

Because of these trust and dependency issues, many Europeans view the U.S. as part of the "dark side" of the information revolution.¹² This could have important implications for future U.S.-European relations.

This European view of the "dark side" of the information revolution is discussed further in Section 10.

In Conclusion

This conference succeeded in its two specific aims:

- To expose the somewhat American-centric picture of the information revolution developed during previous conferences in the RAND series to an informed European audience.
- By so doing, to thereby broaden and deepen our understanding of the future course of the information revolution in Europe and elsewhere in the world.

¹¹ Further prospective research is clearly required, on these and other indicators of success in the information age.

¹² This surprised many/most of the U.S. attendees at the conference. It was probably the biggest surprise they had during the entire conference.

It also raised a number of unanswered – or incompletely answered – questions worth addressing in the future. These are listed in Section 13.

Acknowledgments

The conference on “The Future of the Information Revolution in Europe” was truly a group effort. The results presented here are due to the collaborative efforts of all of the participants, who are listed in Appendix A. They all deserve a major vote of thanks.

Special thanks are also due to the individuals who served as moderators of the plenary sessions and leaders of the breakout groups: Dr. Tora Bikson, Dr. Jonathan Cave, Dr. Peter Johnston, Mr. Thomas Koeppel, Mr. Horace Mitchell, Dr. C. Richard Neu, Mr. Ian Pearson, Dr. Richard Potter, and Mr. Phillip Webb. Thanks are also due to Mr. Colin Crook, who moderated the economic and business discussion track during the virtual conference, but was prevented by illness from attending the physical conference.

Thanks are also due to Dr. Carl Bildt, Professor Sergei Kapitza, Dr. Joan Majo, and Dr. Adrian Mears, who participated in the “panel of observers” during the closing plenary session.

Special thanks are due to Dr. Erkki Liikanen, Commissioner of the European Union, for agreeing to present the keynote address at the conference.

Special thanks are also due to Mr. John Mabblerley, who arranged the participation of DERA in the conference; to DERA as an organization; for all of the support it provided to RAND during the course of the virtual and physical conferences; and to Mr. Eddie Stewart, the DERA Web Master, and Mr. Andy Smith, his assistant, for establishing and maintaining the virtual conference Web site.¹³

Likewise, special thanks are due to Mr. Michel Hess, who arranged the participation of ISN in the conference, and to ISN as an organization for the support it provided to RAND during the course of the conference.

¹³ Subsequent to this conference, DERA has been split up into two organizations: a privatized portion called “QinetiQ” and a portion retained within the UK Ministry of Defence called the Defence Science and Technology Laboratory (DSTL). John Mabblerley and all of the other DERA personnel that who participated in or assisted with this conference are presently employees of QinetiQ.

Thanks are due to Ms. Margreet van der Kraan of RAND Europe and Ms. Christine Strudwick of DERA for handling the myriad of administrative and logistical details associated with the physical conference.

The conference chairman would also like to thank the rapporteurs – Dr. Robert Anderson, Dr. Tora Bikson, and Dr. C. Richard Neu of RAND; Mr. Maarten Botterman and Dr. Jonathan Cave of RAND Europe; Dr. Michelle Norgate of ISN; and Ms. Renée Cordes – without whose efforts this report could not have been completed. Dr. Eugene C. Gritton and Dr. Philip S. Anton of RAND also made a number of valuable suggestions regarding the contents of this report.

Finally, last but very definitely not least, thanks are also due to Dr. Lawrence Gershwin, the National Intelligence Officer for Science and Technology, without whose vision and support this conference would not have been possible.

Dr. Richard O. Hundley
Conference Chairman

1. Introduction

Conference Chairman: Richard O. Hundley

What will be the course of the information revolution in Europe over the next 10-20 years, in all of its dimensions: technology, economic/business, governmental/political, social/cultural, and security? How may the future course of the information revolution vary across Europe, and between Europe and other regions of the world? These questions were the theme of an international conference held on April 25-27, 2001, in Limelette, Belgium. This conference was organized and conducted by RAND and its three research partners: RAND Europe, based in the Netherlands; the Defence Evaluation and Research Agency (DERA), based in the United Kingdom, and the International Relations and Security Network (ISN), based in Switzerland. The conference was sponsored by the U.S. National Intelligence Council (NIC), DERA, and ISN.

This conference was part of a larger, multi-year RAND project, sponsored by the NIC, exploring the future of the information revolution throughout the world.¹⁴ The first step in this effort was a conference held in November 1999 on the political, economic, social, and cultural trends driven by the information revolution as they manifest themselves globally; the proceedings of this conference were published in Hundley et al (1999). The second step was a conference held in May 2000 to explore the technological drivers of the revolution in more detail; the proceedings of that conference were published in Anderson et al (2000). The third step was a conference on the information revolution in Latin America, conducted in November 2000; the proceedings of that conference were published in Treverton and Mizell (2001).

This conference on the future of the information revolution in Europe represented a fourth step toward RAND's over-arching goal of mapping the likely future of the global information revolution over the next one to two decades. This report presents the proceedings of this conference.

The specific aims of this conference were two-fold:

¹⁴ This effort is being carried out in support of the Information Revolution initiative of the National Intelligence Council's Strategic Estimates Program.

- To expose the somewhat American-centric picture of the information revolution developed during previous conferences in the RAND series to an informed European audience.
- By so doing, to thereby broaden and deepen our understanding of the future course of the information revolution in Europe and elsewhere in the world.

We were most fortunate in the caliber of the participants at this conference: roughly 60 senior-level individuals from government, academia, and the private sector, primarily from Europe, with some participants from North America and the Asia Pacific region for continuity with the previous conferences. Their collective breadth of experience and depth of expertise covered most aspects of the information revolution, as it is manifesting itself throughout Europe and the rest of the world. The participants' names and organizational affiliations are given in Appendix A.

This conference was conducted in two parts:

- A one-month web-enabled virtual conference, beginning in late March, 2001, to develop a common awareness regarding different aspects of the subject, identify key themes and issues, and develop arguments and points of view regarding those issues, prior to the physical conference.¹⁵
- A three-day physical conference on April 25-27, 2001, picking up the discussions where the virtual conference left off.

The physical conference featured a keynote address by Erkki Liikanen, the Member of the European Commission for Enterprise and the Information Society (summarized in Section 2 of this report),¹⁶ and five plenary sessions organized along the same lines as the virtual conference. The deliberations of these sessions are summarized in Section 3 (the technology dimension), Section 4 (the economic/business dimension), Section 5 (the governmental/political dimension), Section 6 (the social dimension), and Section 7 (the security dimension) of this report.

¹⁵ This virtual conference was enabled by a Web site established and maintained by DERA, and had five discussion tracks: The Technology Dimension of the Information Revolution (Moderator – Phillip Webb, DERA); The Economic and Business Dimension of the Information Revolution (Moderator – Colin Crook, The Wharton School); The Governmental and Political Dimension of the Information Revolution (Moderator – Peter Johnston, EC Staff); The Social Dimension of the Information Revolution (Moderator – Richard Potter DERA); and The Security Dimension of the Information Revolution (Moderator – Thomas Koeppel, Swiss Federal Office of Police).

¹⁶ Because of Dr. Liikanen's schedule constraints, his keynote address was delivered on the second morning of the conference rather than the first.

Following these plenary sessions, the conference participants split into breakout groups to take deeper looks at various aspects of the subject: variations in the information revolution across Europe (reported on in Section 8); differences between the United States and Europe regarding the information revolution (Section 9); the so-called "dark side" of the information revolution (Section 10); and intellectual property rights in a networked economy (Section 11).

This was followed by a final plenary session during which a panel of senior-level conference participants gave their reactions to the conference discussion, with an emphasis on what they saw as policy implications for Europe. This is reported on in Section 12.¹⁷

This report concludes with some post-conference observations prepared by the RAND organizers of the conference, in Section 13. Appendix B presents the complete conference agenda.

¹⁷ In all of these rapporteurial summaries, we have grouped comments thematically rather than chronologically. In doing so, we have imparted a sense of orderliness that was missing from the conference itself. While this may aid the after-the-fact reader, it fails to capture the pleasant and creative anarchy of the actual event.

2. Keynote Address

Presenter: Erkki Liikanen
Member of the European Commission
Enterprise and the Information Society

Rapporteurs: Renée Cordes and Richard Hundley

The conference was honored to have Erkki Liikanen, the Member of the European Commission for Enterprise and the Information Society, as the keynote speaker. In his address, Dr. Liikanen began by pointing out that although the EU is about 18 months behind the U.S. in terms of Internet use, penetration is now growing much faster on the European side of the Atlantic. Within Europe, there are wide differences in Internet use rates, creating a "digital divide" between the more advanced north and the less advanced south. Narrowing this gap is a top priority for EU policymakers. Liikanen feels that digital inclusiveness is both a societal objective and an economic asset. The European Commission is determined to fight all forms of digital exclusion, and believes that the education system should emphasise basic digital skills for all pupils and life-long learning for all adults.

Given the 63% average mobile telephone user rate in the 15-member European Union (compared to about 40% in the U.S.),¹⁸ Liikanen said that this technology could be a key tool for boosting Internet access in Europe, and that mobile terminals can be very important in tackling the digital divide.

According to Liikanen, continued deregulation of the telecommunications market is equally important. He feels that this is the best way to promote and make the Internet better and more affordable for everyone. In his view, deregulation is the only weapon which brings down prices and improves services.

Regarding the status of telecommunications deregulation in Europe, Liikanen noted that thus far fewer than half the EU member states have fully implemented a new EU directive calling for the unbundling of the local loop. But Liikanen

¹⁸ These are, according to Liikanen, the percentages of the EU and U.S. populations using mobile telephones as of January 2001.

said he was confident that the remaining countries will have put the new legislation into place by the summer of 2001.

Another point emphasised by Liikanen is that the telecommunications market in Europe has rapidly become a pan-European market. While national telecommunications regulators now watch over fair competition in the various local markets and the new EU directive preserves their independence, there is a clear need for these national regulators to consult regularly with their counterparts in other countries as well as the European Commission on all major decisions.

As far as regulating the Internet itself is concerned, Liikanen said that the European Commission's policy is to limit legislation to essential principles in key areas (e.g., taxation, illegal and harmful content, and junk mail), in a technology-neutral way. He feels that these legislative rules should be complemented with industry self-regulation, arrived at in a cooperative spirit. (The EU term for this is co-regulation.) This should be reinforced by cooperation at the international level (e.g., between the EU and the U.S.).

In the long run, the EU executive would like to see governments offering public services such as health and education online. Such online interactivity will, in his view, lead to increased responsiveness, personalization and cost efficiency. He feels that third-generation mobile services and online public services can support each other.

Looking to the future, Liikanen feels that the recent stock market readjustment signals the start of a period of searching for "quality" in IT developments.¹⁹ He foresees a merger of the new and old economies as time goes on, and sees the development of future wireless services as a major challenge, that will do much to determine the course of the information revolution in Europe over the next few years.

In the question period after his talk, Liikanen was asked to comment on the state of entrepreneurship in Europe, given that so much IT innovation seems to come from small, often start-up companies. He answered that compared to the U.S., Europe is weak in entrepreneurship. In order to encourage greater entrepreneurship, Europe must, in his view, cut red tape, change the laws and attitudes regarding bankruptcy, encourage venture capital, and use education to change the "culture." He feels that with the notable exceptions of Nokia and Erickson, the southern European nations are more entrepreneurial-minded today

¹⁹ By "recent stock market readjustment" Liikanen was referring to the downtrend in technology stocks that occurred during 2000-2001, prior to this April 2001 conference.

than the northern European nations. Also in his view, "we can change regulations faster, but culture changes slowly."

Part I.

Various Dimensions of the Information Revolution

3. The Technology Dimension of the Information Revolution

Moderator: Phillip Webb

Rapporteur: Robert H. Anderson

The first plenary session's discussion concentrated on new technology developments foreseen over the next two decades that will affect the form, speed, and impacts of the information revolution. The emphasis was on possible differences between the course of the information revolution in Europe compared with the United States and other regions of the world.

Summary of the Virtual Conference Discussion

Three themes emerged from the virtual conference proceeding the physical conference. They were summarized by the session moderator as: (1) mobile/wireless communication; (2) speech recognition; and (3) biotechnology supplanting electronics in the information age. Some key features of, or issues involving, these three themes are:

- Mobile/wireless communication:
 - an alternative infrastructure
 - any time, anywhere
 - security
 - miniaturization/performance
 - battery/powercell technology
 - wearables
 - implantables
- Speech recognition:
 - personalized interface, universal input?
 - real-time processing
 - natural language
 - artificial intelligence

- translation
- speech synthesis
- Biotechnology supplanting electronics in the information age:
 - greater synergy of sensor technologies
 - increased information monitoring and processing demand
 - reliance on electronic communication
 - lowering of the interfaced threshold
 - biotech data processing
 - quantum computing

The moderator also introduced a chart (see Fig. 3.1) first developed by the Gartner Group that arrays technologies and new applications in a two-dimensional space showing their level of visibility versus their maturity.²⁰

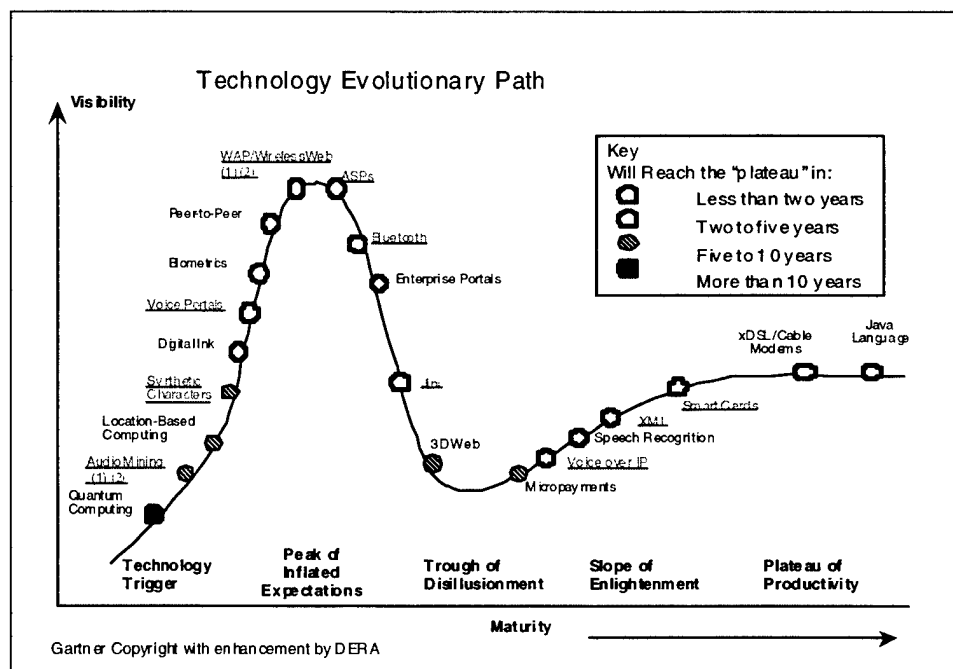


Figure 3.1 Technology and Application Visibility vs. Maturity

The resulting session discussion can be grouped into several categories: other technologies and developments whose use or spread or implications may differ between Europe and the U.S.; and whether there is a "single stream" of technology that is worldwide, or whether some aspects are distinctive in Europe.

²⁰ Used with the permission of the Gartner Group. The gray, underlined entries are ones added by DERA to the original Gartner diagram.

Other Technologies and Developments Mentioned by the Audience

Regarding *battery and energy storage* technology: It was mentioned that for “wearable” computers, use of “footfall” (walking) motion might be converted into usable energy. Also, solar power might be used more productively than at present.

A participant cited the proceedings of an earlier (May 2000) technology conference in this series,²¹ in which there is interesting discussion of “agents” *software* technology, and of perhaps greater availability of “common sense reasoning” in computer programs.

Display technology will have dramatic developments in the coming decade, through greater use of nanotechnology and other technologies. This will increase the ubiquitousness of computing within society.

Pervasive computing may become the standard, so that your files, and desired computation power, will be available “everywhere” and need not be carried around with you. You simply plug into the net to access all you require.

Peer-to-peer computing may become more important. It was noted that it is important, as a policy issue, to keep the development of networks symmetric to allow this form of computing and communication to flourish. (That is, network links should have rich bandwidth in both directions: both to users and from them. Many networks today – such as cable TV or even interactive TV – are asymmetric, providing rich bandwidth to the user, but expecting only very limited “upstream” communication back from the user.)

Photonics was mentioned from its discussion in the earlier technology conference as a disruptive technology that will have a major effect on existing telecommunication companies.²²

Digital TV was viewed as developing somewhat differently in Europe, compared to the U.S. For example, in the UK about 30% of households have digital TV, supplied mainly by satellite communication links. When it is interactive, it is

²¹ See Anderson et al (2000).

²² By “photonics” is meant, in the first instance, the use of optical, multiwave transmission lines and optical amplifiers and switches. These will make possible all-optical networks with a quantum jump in communications bandwidth, to thousands of gigabits/sec. These transmission speeds, greater than the main memory bus speeds of current workstations, will give rise to major changes in computer architectures, operating systems, and networking protocols. Application software will also change, probably becoming much more distributed as communications capabilities expand and costs decrease dramatically.

highly asymmetrical, so it may not be an appropriate platform for truly interactive communication.

Differences between Europe and the United States in Technology Development and Usage

Each session was asked by the conference organizers to address specifically differences between Europe, and the United States and the rest of the world. The following differences between Europe and the U.S. were highlighted in this session's discussion:

- *Consumer behavior* differs between Europe and the U.S. (and within regions of Europe). Some of the causes are: (1) relative differences in wealth among regions; and (2) borrowing/lending policies and institutions. For example, in impoverished areas, there is much advertising in the media about where and how loans may be obtained; in those regions, smart cards containing digital "cash" to be used (e.g., in telephones) are important, because they do not require a line of credit. In richer regions, it is assumed that a credit card will be used, and such digital cash schemes are much less important.
- Because of the differing languages used in Europe, the role of *visual languages* may assume greater importance there. By "visual" languages are meant diagrams, and even hieroglyphic-type shorthand symbology like the "smiley face" :-), that avoid the need for translation. It was noted that the Ikea company's graphic diagram assembly instructions are an exemplar of this type of language-independent communication. For specialized communities, "jargons" are specialized languages that tie communities together, and are specific enough that translation among languages within communities sharing the jargon is possible, reducing some of the costs and errors usually involved in translation.
- One observer stated that he believed that there will be 90% *penetration of mobile telephone technology* throughout much of Europe within the next 5 years. In the U.S., by contrast, the emphasis is on using wireless technology for LANs (e.g., within a building or airport). The U.S. approach appears to be more sophisticated – for example using higher bandwidth – but is relevant to the lives of fewer people. If these trends continue, one might expect Europe to lead the way in the development of applications for widespread wireless devices such as cellphones. Another effect being seen in Europe because of this penetration of wireless technology is that some

households no longer see the need for a wired telephone, since all household members (above a minimum age) have their own cellphone.

- It is likely that nanotechnology, combined with electronics and wireless (e.g., Bluetooth protocol) communication, will make *implantable devices* (within humans) possible. But the reaction to this may differ between Europe and the US. Europe has been much more reluctant to adopt genetically modified (GM) foods; perhaps the European reaction to invasions of the human body by implantable devices might also be greater than in the U.S.
- There appears to be a strong cultural difference between U.S. and UK on the one hand, and much of Europe on the other, related to "*identity cards*." The U.S. and UK populations view such cards as invasive of their privacy, and abhor them. Many European countries have identity cards, which have led to widespread use of individual smart cards that contain personal identification information, but that then can be used for varieties of e-commerce.
- There was a comment that the information revolution to date has mainly been adopted by an educated elite within various countries, and most of them speak English as a first or second language. However, as the information revolution spreads more deeply within societies, the *multiple-language issue* will become increasingly important in Europe, because those parts of society won't be using English as a *lingua franca*. This is a distinguishing factor between the European and U.S. markets.

Other General Technology-Related Audience Comments

In the more unstructured discussion that followed, participants made the following points:

- *Some non-standardization* in technology between Europe and the U.S. (and other regions of the world) is *deliberate* – for example, the differing regional security/encryption coding of DVD disks used by manufacturers to prevent their copying across regions of the world.
- The differing information technology maturity across European countries, and between Europe and the US, causes *security/defense problems*, for example in coordinating differing countries' defense information systems when cooperating in a rapid-defense force.

- The important role of technology “giants” like Microsoft, Oracle and Cisco was noted. They have the power to create worldwide *de facto* standards. Information technology seems also be to quite unique in that one dominant player can handle the needs of the entire market, so *monopoly creation and behavior* is more easily found in this sector.
- There is a market evolving for *unused computing power*, using peer-to-peer technology. For example, Juno (which has been supplying free email services though use of online advertising) has announced that its users will be required to allow the company to sell unused computing cycles within those users’ machines. This combined distributed computing power is becoming a market commodity.
- On the topic of peer-to-peer computing, it was noted that *machine-to-machine interactions* will be a huge development as more and more devices become linked to the Internet and other local area networks (both wired and wireless). The classic example is a Coke machine signaling to a distributor’s computer that it needs a resupply.
- It was noted that *speech recognition and generation systems* are being increasingly used by the blind, and other differently-abled groups (such as those with forms of dyslexia). There remains a big difference between the effectiveness of speech recognition systems tuned to individual users and the lesser capabilities of those systems meant to be used by a wide variety of users.

Since technology developments in information systems and communication were the subject of a previous conference in this series, it was felt by the session moderator and conference organizers that the main purpose of this current session was to quickly review those developments, and concentrate on differing perceptions between Europe and other regions regarding how such developments would be received (or suppressed, if possible) and used. With the wide range of issues mentioned above, it was felt that a good groundwork had been laid in the above discussion for subsequent sessions on issues in economics, social issues, government and governance, and security.

4. The Economic and Business Dimension of the Information Revolution

Moderator: C. Richard Neu

Rapporteurs: Richard Hundley and C. Richard Neu

The Virtual Conference

The moderator began the session by summarizing the discussions that took place during the virtual conference.²³ Four main topics were raised in the course of the virtual conference.

The "new economy." There was general consensus among participants in the virtual conference that discussion of a "new economy" and debate about whether information technology is creating an economy that is "new" in some meaningful sense is not particularly helpful. All participants acknowledged that information technology is indeed affecting the economy – creating new opportunities, allowing old tasks to be done in different ways, shifting relative costs, etc. But there seemed to be little sympathy for the notion that we have witnessed or will witness some discontinuous change in economic processes, economic behavior, or fundamental economic laws. Indeed, during both the virtual conference and the physical conference that followed, participants were able to discuss the consequences of new information technologies for business quite comfortably using the language and the broad conceptual framework of traditional economics.

What is driving or shaping change in business and economics? There was some discussion during the virtual conference about the factors that are really driving change in the business and economic environments. Some participants warned against a technological determinism that places excessive emphasis on new technologies as the principal causes of changes in business practices and economic interactions. They noted in particular that technology, by itself, is

²³ The virtual conference on this discussion track was moderated by Colin Crook, of the Wharton School and formally Chief Technology Officer at Citigroup. Illness prevented Mr. Crook from attending the physical conference.

unlikely to provide satisfactory explanations for *differences* among advanced industrial economies – between, say, the United States and Western Europe. Advanced economies have access to the same technologies, they noted. Yet the degree to which these technologies have been adopted, the purposes to which they are put, and their apparent consequences for business and economic life vary significantly from one country to another. Some participants, for example, suggested that differences in national policies – encouraging or discouraging private investment in information technology, facilitating or hindering economic restructuring to take advantage of new technologies, shaping private attitudes towards risk-taking, and so on – may be the underlying reasons that different economies have exploited technology in different ways and that technology has affected economies differently.

The nature of European and American markets. In a similar vein, others emphasized differences in the character and the structure of U.S. and European markets, noting that European firms are only now beginning to recognize the advantages and the challenges that come with doing business in a very large and increasingly competitive market. American firms, of course, have faced these advantages and challenges for years. It is perhaps no surprise, therefore, that American firms seem to have been quicker to exploit technologies that support efficient large-scale operations. Alternatively, the very diversity of European tastes and requirements may make Europe particularly fertile ground for information technologies that support easy customization of products and services. Participants in the virtual conference also took note of differences between European and American labor markets and capital markets. No clear conclusions were reached during the virtual conference on how these differences have influenced the use or the consequences of information technology in Europe and the United States. All of these subjects, though, attracted attention during the physical conference.

The influence, dominance, and control of the United States in information technology. Virtual conference participants emphasized the degree to which the United States, U.S. culture, U.S. business practices, firms with strong U.S. bases of operations, and English dominate international business – and, increasingly, European business – today. Some saw information technology as contributing to U.S. dominance by facilitating the spread of all things American and by strengthening the economies of scale enjoyed by large – i.e., American – firms. The question lying beneath this realization is whether Europe will or should find a different way to exploit the advantages of new technologies. Is the American way of modern business the best way or the only way? Must or should the broader social and economic consequences of the information revolution in

America be repeated in Europe? Will the advantages that accrue to first-movers be such that Europe cannot chart a different course as it incorporates information technology into its business and economic life.

The Physical Conference

A few major themes dominated face-to-face discussion of the business and economic consequences of new information technologies. As is often the case in conference discussions, these major themes appeared and reappeared in a somewhat disjointed fashion. In this summary, we have grouped comments thematically rather than chronologically. In doing so, we have imparted a sense of orderliness that was missing from the conference itself. While this may aid the after-the-fact reader, it fails to capture the pleasant and creative anarchy of the actual event.

Differences between Europe and the United States

Conference participants explicitly recognized that the advanced economies of the European Union and the United States are more like each other in their use of information technology and in the business and economic consequences of this use than either is like any other region of the world. All participants also recognized that the advanced economies of the EU do not constitute all of Europe – in economic, demographic, political, or social terms. Nonetheless, most of the conference discussions focused on differences between Western Europe and the United States. This focus was not surprising, of course, in light of the issues raised during the virtual conference. Many conference participants found interesting the fact that two regions with such similar endowments are nonetheless responding differently to emerging technological opportunities.

The most prominent subject of discussion was the difference between **American and European approaches to economic and social change**. Various commentators noted that substantial changes in patterns of economic activity are required to take full advantage of new information technologies. Firms must be restructured. Sometimes firms or pieces of firms have to be closed or sold. Entirely new firms must be created to pursue new lines of business. Many firms will face a need for substantial investment in new equipment, new processes, new products, and new kinds of human capital. Demand for particular kinds of workers changes. Some workers will be laid off while other kinds of workers will be in short supply. Some traditional jobs will become dead ends, but other workers will see expanded opportunities.

Considerable attention was focused on the relative difficulty of such change in Europe, compared to the United States. Several commentators noted, for example, that labor mobility is low in Europe. European labor laws make it difficult or expensive for firms to lay off redundant workers. These same laws discourage employers from hiring new workers when business prospects are uncertain. European workers show little willingness to move from one region to another (even within the same country) to take advantage of employment opportunities. Because academic and professional credentials are not fully standardized yet, employers sometimes find it difficult to identify satisfactory workers who come from different parts of Europe. The consequence of all of this is that the labor market “churning” associated with economic change, as workers leave old jobs and find new ones, is more painful in Europe than in the United States.

Some participants saw information technology as providing increased opportunities for “virtual mobility” that will allow workers to take new jobs without leaving areas where they are linguistically, culturally, or socially at home. Others, however, pointed out that the physical location of firms and their workers seems to remain important, as evidenced by the persistence of geographically concentrated industrial “clusters.”²⁴

Some participants noted that European corporation law and patterns of shareholding complicate mergers, acquisitions, divestitures, and other changes of corporate control. Gaps in European financial markets, especially the absence of a robust venture capital market, hinder start-ups of new firms. Other participants noted that formal European bankruptcy law and informal social norms attach severe penalties to business failures and therefore discourage risk taking.

More broadly, participants noted a general distrust in Europe of major economic or social changes. One commentator noted that Europeans tend to consider carefully and to engage in lengthy debates about the consequences of potentially important new technologies or economic arrangements before adopting such changes. He contrasted this with what he saw as an American penchant simply to leap into such changes confident that ways will eventually be found to manage any negative complications that may arise. Voicing a similar sentiment, another commentator noted that the best-selling books on information technology in the United States tend to emphasize the wonderful new opportunities afforded by this technology. In contrast, best-selling European

²⁴ One participant cited several relevant references in this regard: Porter (1998); Braczyk, Fuchs, and Wolf (1999); and Micklethwait and Wooldridge (2000), especially pp. 210-214.

books on the same subject dwell on the potential for new technologies to disrupt or to undermine established social patterns.

The net result, several commentators noted, was that the process of "creative destruction" by which new technologies and business paradigms replace their predecessors proceeds more slowly in Europe than in the United States. One commentator, however, noted the irony of this situation. Europe, he pointed out, had suffered enormous destruction during the last century and had been rewarded with very creative and effective social, political, and economic mechanisms.

Another key theme in conference discussions was the relative importance attached to **equity and efficiency** in Western Europe and in the United States. Several participants questioned whether European concerns for equality of outcomes was consistent with the kinds of risk-taking and the occasionally large rewards associated with a dynamic information technology sector. Others noted Europe's search for *win-win* applications of information technology, which allow everybody to be better off. They contrasted this with American willingness to accept *trade-offs* of benefits for some groups against losses for other groups and noted that the American approach is likely to result in a more aggressive pursuit of new technologies.

Closely related is a European desire for **convergence** among the countries of Europe, including those not yet admitted to the European Union. No one at the conference questioned the political value of efforts to reduce gaps in the prosperity of different European countries, but some wondered if pursuit of such objectives is consistent with full exploitation of the opportunities afforded by new technologies.

One participant noted that although Europe is and will likely remain attached to the ideals of social equity and inter-European convergence, influences already afoot will inevitably make Europe more like America--more tolerant, that is, of disparities in income and wealth within nations and more realistic about the fact that all nations cannot achieve similar rates of economic development. The completion of the European market will increase competition within Europe, eroding previously protected markets.²⁵ The Stability Pact will limit

²⁵ "Completion of the European market" is a phase that is commonly applied (in Europe) to a constellation of public- and private-sector actions that will eventually result in the EU becoming a single market — for goods, services, labor, and finance. Most official barriers to the flow of goods, services, and labor within the EU were eliminated in 1992. The fixing of exchange rates in 1998 removed further barriers to intra-European transactions. The imminent arrival of the Euro currency will be yet another step in this direction. European governments continue to harmonize national policies to make commerce and finance increasingly borderless. And private companies are gradually realigning and relocating operations to take advantage of the opportunities afforded by the

government deficits, and competition for employment and investment will restrain taxation. EU enlargement will only heighten this competition. Similarly, adoption of a common currency will speed the integration of European financial markets and intensify competition for investment. The result of these forces will be to limit the capacity of European governments to pursue social equality. Although European governments will remain "officially" committed to equality of outcome among their citizens, the "reality" will be increasingly laissez-faire policies that will hasten the incentives for and increase the rewards accruing from successful exploitation of information technology. Other participants warned against generalizations that suggest that Europe shares a single approach to preserving social equity. In fact, there are many models within Europe, and these models will find themselves increasingly in competition.

Some Common Challenges

Despite the emphasis on differences between the United States and Western Europe, there was some discussion of challenges that both societies face with regard to information technology. Both societies, for example, will have to arrive at workable methods for allocating and protecting intellectual property rights in an information age. One participant noted different European and American perspective on this issue. Europeans, he asserted, have tended to emphasize the *non-exclusivity* of information (one person can use information without diminishing its value or availability to another) and to seek equitable ways of sharing information. Americans, on the other hand, have tended to emphasize private rights to intellectual property in the hopes of encouraging innovation and creation. Although some participants stressed the difficulty of reconciling these two points of view, there was general consensus that America and Europe will have to come to some common understanding of the appropriate meaning of intellectual property rights and of appropriate measures to safeguard these rights.

Other participants emphasized the common problems faced by firms in both the United States and Europe in managing payments for content delivered through the agency of new information technologies. No one, it was noted, has yet developed a satisfactory approach to micro-payments for small quantities of information. Without such a payment mechanism, some argued, the full

expanded European market. The full implications of economic and financial liberalization that has swept Europe in recent years have not yet been felt, and it is in this sense that the single European market is not yet "complete."

potential of new technologies to deliver large amounts of information is unlikely to be realized.

Another participant expressed the view (apparently widely accepted among participants) that threats to privacy constitute a "time bomb" for businesses seeking to utilize new information technologies. He noted serious differences between America and Europe over citizens' rights to privacy and over what constitutes adequate protection of these rights. The seamless nature of the information environment, however, will eventually force American and European users of new technologies to adopt common standards.

Some participants expressed the notion that differences in government policies and national cultures as they relate to business and the exploitation of information technology will eventually become irrelevant. The imperative of doing business globally will eventually force firms to adopt more or less similar business models. Consumers who wish to avail themselves of the benefits of global commerce will eventually adjust to a global way of doing business. Differences between Europe and the United States in the ways that information technology shapes the business and economic environments may be important – economically, socially, and politically – in the medium term. But eventually – and perhaps not too far in the future – these difference may be rendered insignificant.

5. The Social Dimension of the Information Revolution

Moderator: Richard Potter

Presenter: David Leever

Rapporteur: Tora Bikson

The charge to conference participants interested in the social dimension of the information revolution was to consider the societal and cultural changes it might bring about, ranging from disparities associated with a digital divide to opportunities for e-learning and more far-reaching effects on European social and cultural values. Figure 5.1 illustrates the potential scope of the social dimension as well as its close connections to the economic and political dimensions of the information revolution.

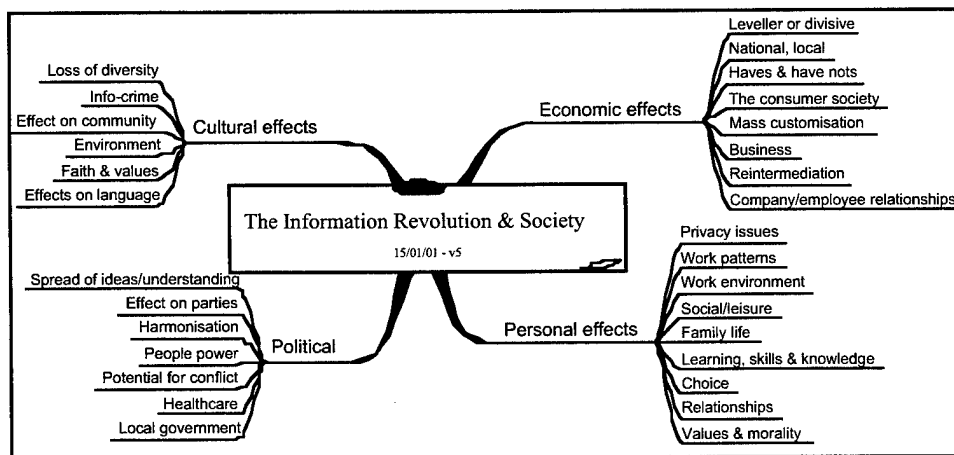


Figure 5.1 The Information Revolution & Society

The session moderator used this figure to make two points. First, the information revolution is likely to have a profound effect on almost every aspect of society across Europe. Second, it's not clear whether it will be a force for good or evil. Will it bring greater prosperity and contentment for all, or will it increase the social divide within and between nations?

To set the stage for a plenary discussion of these issues, the moderator suggested three starting platforms: a brief review of major themes emerging from sessions on the future shape of the information revolution in Europe at RAND's November 1999 conference; an overview of key issues raised in the virtual conference; and a vision of the future transformation to a global sustainable network society. These presentations are summarized below and are followed by an account of the discussion from the floor.

European Themes from the November 1999 Conference

While providing useful background material, a reprise of themes from the earlier conference would also enable conference organizers to gauge the extent to which those points are corroborated by present conference participants.²⁶ Where cases of disagreement appear, it could also be useful to inquire whether differences are due to changes that have occurred in the intervening 18 months or instead reflect quite divergent assumptions held by the two groups.

The session rapporteur summarized the deliberations of the European breakout group at the earlier conference under four main topics: European context; governments, markets, businesses, other players; intellectual capital as a major asset; and future vision.

European Context

European society is characterized by dense complexity, embedding a diverse set of languages and cultures in a relatively small space; this circumstance presents both problems (e.g., communication barriers) and opportunities (e.g., exposure to richly varied societal forms from which to generate new models for the information age). It is also characterized by shifting power bases. Europe is currently engaged in adding a layer of "federation" via the EU. Nation states still retain most of the power and, while there is debate over how much control should be handed over to EU bodies, citizens themselves are increasingly mobile and independent of their national states.

With respect to technology, Europe sees itself as coming from behind; the information revolution happened first in the United States with Europe getting off to a late start. However, it expects to lead in telecommunications, cellular technology, and standards.

²⁶ See Hundley et al, (2000).

Governments, Markets, Businesses, Other Players

In contrast to the United States, participants in the previous conference believe that Europe is generally more skeptical about information technology, not viewing it as a good in itself. Similarly, Europe does not believe that "free" markets should determine, in uncontrolled ways, the outcomes of the information revolution. Nineteenth-century industrial capitalism, they argued, might not be right for the new knowledge economy.

Rather, Europe embraces a stronger role for government policy to safeguard shared values in the information society. Such values include, for example, spanning the digital divide, promoting equity, protecting privacy, encouraging civic participation and in general promoting the quality of life for all citizens.

Further, participants envisioned a growing role for transnational entities in shaping the future of the information society. These may include unions, political parties and professional guilds as well as nongovernmental organizations and multinational corporations.

Intellectual Capital as a Major Asset

Participants in the November conference believe that Europe's strong educational tradition places it well ahead of the United States in generating intellectual capital. This will be a critical asset in a knowledge-based economy.

Accordingly, participants foresee Europe leading the transformation of information – with which we are overloaded – into knowledge. They also raised the possibility that Europe might become a leading provider of high quality content for new digital media.

Future Vision

The future as well as the present vision of the information revolution in Europe should take into account modifying factors which will result in different conditions in different parts of the continent. For example, the value accorded to information technology as well as the penetration rates differ markedly on a north-south axis, with southern European countries ranking lower on both. On the east-west dimension, countries differ considerably with respect to banking systems, availability of credit, and the role of black/gray economies. Further complications are introduced by the role of historic and cultural ties that create far more subtle relationships between countries than geographic proximity alone.

An orderly revolution ahead was the overarching prediction for Europe. The information society here will be shaped by deliberation and consensus, with strong importance attached to shared technology standards and to legal harmonization. “e-Europe” will move forward as a community, not as fast as technologically possible but at a socially sustainable pace.

Key Issues from the Virtual Conference

Next the session moderator reviewed the key issues arising in the online discussion of the social dimension of the information revolution that preceded the conference. He began with points about which there was general agreement.

Short to Medium Term Effects

There appeared to be general agreement, or at least no debate, about many of the short to medium term societal effects of the information revolution in Europe. These include, for example, instant access to information, wider access to high quality education, the growth of e-commerce, the growth of e-services in many fields (e.g., healthcare), and the growth of networked communities that span prior geographic and societal boundaries.

Interestingly, no one questioned the assumption that “we (i.e., Europe) must keep up in the technology race.” Conference participants might ask whether this should be taken to be either inevitable or beneficial.

Drivers of Change

There was more contention about what drives such changes. New technology *per se* is seen as an enabler—it provides new opportunities. But it is their take up and exploitation by people and organizations that really drives change, and these events are significantly influenced by market forces.

It was agreed that governments and other regulatory bodies also influence technology-enabled change. Further, when people feel strongly enough about a shared value, they too can influence technology-related social change. Considerable attention focused on how much weight could, or should, be given to the differing drivers of change. In this topic arena, discussion of the social dimension overlapped significantly with concurrent discussions of the government/political dimension and the economic/business dimension of the information revolution.

Future Scenarios

The virtual conference generated three different scenarios for the future course of the information society in Europe, summarized below.

- *[Accelerated] evolution without radical change:* In the past, the computer was predicted to result in shorter working hours and the paperless office; in fact, although information tasks are now handled much differently than before, the anticipated radical changes in working life did not occur as a result. Why should the communications revolution be any different? That is, why would we expect it to yield revolutionary rather than evolutionary societal change?
- *Network Society:* In this scenario, networked groups comprising changing coalitions of different entities in civil society (e.g., unions, issue groups, NGOs, and so on) become a significant influencing force in society (for good or ill).
- *Global Sustainable Society:* Here, too, a networked society is envisioned, but one in which “immaterialization” (see further discussion, below) helps to achieve one that is fair, fulfilling, prosperous and sustainable. It was acknowledged that such a future is not likely to come about without significant intervention by governments and social change agents.

Future scenarios can, of course, be strongly conditioned by other factors that are not directly related to the information revolution (e.g., advances in biotechnology, global warming).

A final question was raised as to whether this discussion thread is about what will happen in the future or what we would like to happen. It is actually about both — outcomes of the information revolution will depend to a large extent on the desire and ability of society to exert influence.

Toward a Global Sustainable Society

The third scenario outlined above yields a vision of a future for society that is sustainable, equitable, and desirable through the substitutive use of information and communication technologies to reduce material consumption. Virtual conference participant David Leever, who introduced this innovative vision in the social dimension discussion, was asked by the moderator to present it in more detail to the entire group during the plenary session.

Global sustainability, according to the speaker, presents genuine constraints on what any revolution can achieve for society. But most (perhaps 75 percent) of all

material consumption is unrelated to basic survival needs but rather is intended to satisfy nonmaterial needs (e.g., individuality, status in society, desire for new experiences, and so on). Thus, he argued, immaterialization of consumption through the use of information and communication technologies could achieve order-of-magnitude improvements in use of nonrenewable resources and offer a powerful route to global sustainability. For example, more mature information society technologies might create an enhanced reality that could supersede the craving for physical travel experiences and physical status symbols. And such digital goods could be made available to all by means of a global and ubiquitous network.

Such a transformation, according to Leever, would require two kinds of paradigm shifts. One is a move beyond human-computer interaction, which focuses on individuals and the interface to their computers, to the conception of an infrastructure for persistent society-network interaction. In this conception, the network becomes an encompassing digital ecosystem. The other required shift is a move toward thinking not about individuals in nations but rather toward thinking globally — here the social ecosystem becomes the entire world. The technical paradigm shift is associated with a great many specific changes, such as the move from a store-and-forward information society to a more equitable peer-to-peer network society. The social paradigm shift, meanwhile, is associated with such changes as moving from individual information and cognition to communities and collaborations that reach well beyond Europe to span the globe.

Figure 5.2 represents paths the developed and developing world could take to achieve a globally networked society in comparable time frames.²⁷

Finally, Leever argued that realization of any vision aimed at sustainability, equity and prosperity on a global basis will require coming to grips with the ethical aspects of the information revolution.

²⁷ See Leever (2001).

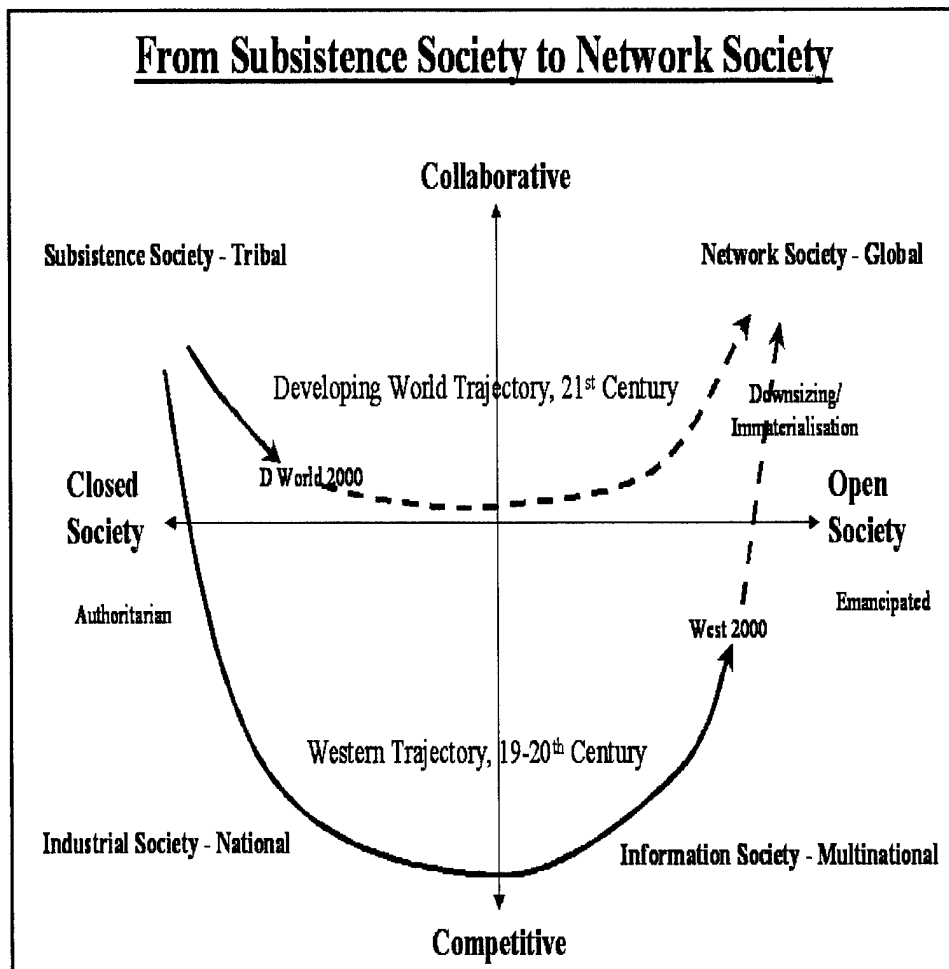


Figure 5.2 From Subsistence Society to Network Society

Plenary Discussion

To stimulate discussion from the floor, the session moderator posed the following series of questions to participants:

- Will the information revolution create a revolution in society or merely accelerate its evolution? What novel features or “emergent properties” will we observe? In particular, how will network society manifest itself? How will it exert influence? How does it differ from existing pressure groups?
- Is immaterialization to achieve a global sustainable networked society a practical goal in the next 20 years?

- Can the information revolution create more equality and yet preserve desirable diversity in Europe? Is the different approach to social responsibility (between Europe and the US) a factor that could differentiate the outcomes?
- To what extent will anyone be able to (or want to) control or even influence the outcomes?

Comments from plenary session participants are organized into four general topic areas below, paralleling the four groups of questions above.

Network Society

Participants called attention to the distinctive properties of networks as social organizations. First, group membership is partial, overlapping, permeable, and unstable. Today's digitally-based networks are much more permeable, for instance, than yesterday's "old boy" networks. Second, in networks there are not distinct boundaries between the self and the social organization, and communities are not clearly delineated.

In networks, moreover, shared values rather than formal structures are what bring people together. Further, information is not exchanged, per se, in networks; rather, it multiplies.

But networks don't do or produce anything; the input-transformation-output model does not apply to them. Instead, networks need to be linked to systems of transformation to create value.

Sustainability

Participants were divided with respect to whether the information revolution will hinder or enhance sustainable development. Some argued there is no evidence that enhancements occur economically or environmentally, although they might arise in the societal dimension.

Others suggested that new information and communication technologies definitely enable more sustainable progress, but their actual use to enhance sustainability in the economy and the environment will depend on education and on government policy. Information and communication technologies can lead to sustainable work, for instance, but it will demand mass education; consequently these same technologies will have to be used to educate the future middle class of the world. The development of social policies that promote

sustainability in the information society, meanwhile, is an important stream of work for the EU and other bodies.

Other participants questioned whether we presently have enough feedback to understand the environmental consequences of the present course of the information revolution. It may be too soon to tell what they are.

Social Values

Reconciling diversity and equity, and protecting individuals' rights to free expression, comprise one set of social value issues raised by participants. At minimum, it is critical to limit the ways that new digital technologies can be used in repressive modes and to exploit their capability to foster both equity and diversity. In a fully networked interactive world, some participants noted, individuals do not have to be subject to the tyranny of the majority. Rather, everyone can be a content provider; and all people can pursue their own conception of "high quality" content amid the plethora of offerings. Even today, the notion of mass customization is associated with an appreciation for the diversity of individuals.

Another constellation of comments addressed privacy issues, which will loom even larger as sensor technologies multiply and as mass storage devices facilitate data retention and retrieval. Often it is taken for granted that the role of the legal system is to protect privacy while advances in technology make it ever easier to invade. What is needed, said one participant, are ways to stimulate innovative technology development to promote and protect privacy. Another participant pointed out that, along with privacy needs, new networked technologies and online transactions also increase needs for trust in third parties.

Several participants noted that the legal system has not kept up with the information revolution; how the system evolves in Europe and the United States will, however, affect the future course of the revolution. Finally, one participant remarked that in the future we will need world laws on privacy and other social values; in a global network, national-level laws do not make sense.

Market Forces and Policy Control

Participants engaged in a lively debate about the role of markets following a comment by one attendee that the market will determine the course of the information revolution with respect to outcomes like those discussed above. For example, some participants argued, the prediction that Europe will become a

provider of high quality content (made at the November 1999 conference) is likely to be falsified by market forces – there is no consumer demand for high quality content; and Europe will probably produce low quality content to pay for its IT/telecommunications investments, which have been very costly.

Another group of participants contended that, while governments cannot control the market in the long run, they can profoundly influence the market's decisions. Additionally, values associated with products and services can significantly influence consumers' market decisions; the public response to genetically modified foods was offered as a case in point.

Finally, other participants urged conferees to avoid oversimplification in favor of greater clarity in the debate. There are many "markets," some optimizing profits, some optimizing consumer needs, and so on. Further, it is possible to create market incentives to support societal values. For example, along with mass education, taxes can be used to promote sustainability. Differences were noted between the United States and Europe with respect to how externalities are assessed as well as the efforts to control them.

6. The Governmental and Political Dimension of the Information Revolution

Moderator: Peter Johnston

Rapporteur: Maarten Botterman

The moderator opened the session by stating that the information revolution creates opportunities for more efficient government and for new forms of governance. There are expectations on both sides of the Atlantic that the efficiencies achieved in the business world through IT can also transform government into a better service provider.

But there are also numerous questions that must be addressed. Can government keep up with the changes in business and civil society? Will e-government be more efficient and cost less than traditional government? And will e-government be more accessible to a greater number of people, or will it exclude people who are unconnected and disadvantaged?

The discussion was set up to address the two main issues:

- *eGovernment*: the issue of transforming government administrations engaged in the provision of public services.
- *New governance paradigms*: the issue of inventing more participatory self-governance, and overcoming constraints from the past in doing so.

The two issues were addressed separately. A large part of the discussion focused on the future of education as a cross cutting topic. While Europeans view education as a function of government, Americans place a higher value on individuals' own responsibility in this area. A separate subsection is therefore devoted to education.

eGovernment

The Moderator raised the following issues with respect to eGovernment:

- Can Governments lead? Can they even keep up with changes in business and civil society?
- Will eGovernment be more efficient and cost less? Or will it cost more?
- Can eGovernment be more accessible to more people? Or will the unconnected be disadvantaged?

Can Government Lead, or Even Keep Up with Changes?

It was argued that governments can and should lead in some areas, although this was not assumed necessarily to be the case in the U.S. However, participants agreed that there is a distinct role for government in removing barriers to innovation.

The moderator highlighted the concern that public administrations often remain too much stuck in traditional ways of working. Modernizing the public sector is no longer primarily a matter of introducing new technologies; working practices and rules must be changed to realize the benefits of technology. Governments are slower to get services online; electronic public procurement (i.e., more than simply accepting emailed bids) is not yet a reality (e.g., e-market places are not being used); and public sector information crucial to value-added services is not made readily available in all member states of the European Union. Progress has nevertheless been made in some areas, notably in the speed with which the legislative framework for the new economy is being established.

The Internet sector is now big enough to exert an influence on the entire economy. With regard to the eEurope initiative, the moderator noted that the European Council of Ministers concluded in Stockholm in March 2001 that the public sector should lead, not trail, in the take-up of new technologies. The public sector should both establish the legal framework for the private sector to flourish and exploit technology to bring more efficient delivery of public service.

Participants questioned whether it would be realistic to expect that type and amount of leadership from governments. The moderator said he was optimistic that the 15 member countries of the EU would be able to become e-economies by 2010, as declared by EU leaders (i.e., in the eEurope initiative). He said that the benchmarking exercise currently being undertaken by EU member states would help in this process. "This benchmarking between the member states is a very powerful tool to transform themselves at the speed of the best," he said. Some participants questioned whether the pressure of public opinion would suffice to drive governments in this matter.

One of the participants noted that in discussions about eGovernment two things are often confused: ePolitics (i.e., participation, elections, etc.) and ePublic Services (i.e., efficiency, costs, etc.). In the latter, there is not such a big difference between government and private business, and some governments have begun to move down that path now. In the former, there is a lot of difference between government and business, and in the short term eGovernment will cost more, since until we have universal access by citizens with a reasonable level of parity in cost and performance, most activities will need to be made available offline as well as online. While there can be savings even in this mode, running parallel systems will mean some extra costs.

As to the longer term, it depends on the view taken by particular administrations/policy makers regarding the well known dichotomy between "less government" versus "more/better public services". In this respect, government is like industry. An expansionist company sees the technology as providing cost reduction in some aspects of its activities, plus growth drivers for other activities. A company under siege pursues only cost reduction opportunities.

In principle, one might see eGovernment in its widest sense enabling a rebalancing of available tax revenues, with (again as industry tries to do) a shift of money from internal administrative costs and external transaction costs towards more/better customer services and beneficial outcomes. Other philosophies would prefer that government take less tax, leaving more money in the economy to fuel growth and innovation.

Another participant noted that the argument for short term cost ballooning is predicated on the availability of manual and computing-based solutions so that parallel running is the order of the day. This participant suggested that a more radical/rapid take up approach would be to select streams of government processing/services and make these exclusively on-line. Spend money that (potentially) would have gone into expensive manual support on better targeting of audiences for services using strategically placed technology portals (e.g., hospitals, libraries, transport convergence points, sports facilities, etc.).

*Will eGovernment Be More Efficient and Cost Less?*²⁸

It was argued that over the short term eGovernment will cost more, since until there is universal access for citizens with a reasonable level of parity in cost and

²⁸ This issue was discussed mainly in the virtual conference, and received little mention during the physical conference.

performance, most eGovernment activities will need to be made available offline as well as online. While there can be savings even in this mode (for instance in implementing a front-office/back-office approach, streamlining business processes within government, etc.) the necessity for parallel offline and online operation in the initial phase will mean some additional-costs.

Over the longer term, when electronic access has become universal, less parallel operation would be necessary and the cost for providing the same level of service should go down. Of course, it will depend on the view taken by particular administrations/policy makers whether this will mean "less money to government" versus "more/better public services."

One participant suggested that governments should look at the business models of new, successful companies, like CISCO. These companies do everything via the Internet:

- Customer care: more then 80% of customer requests are solved/answered on line;
- Work force optimization;
- E-learning for the work force;
- Supply chain management.

Will eGovernment be Accessible to More People?

This matter is discussed further in the subsection on education. The concern here is that services not only need to be available, but also that people must be able to use them, both in the sense of affordability and in the sense of knowing how to use them.

Governance

In his contribution to the virtual debate, the moderator pointed out that globalization and network-based activities (e.g., the Internet, etc.) raise extra-territorial governance issues, some of which can only be handled collaboratively between governments, multi-national businesses and civil society organizations.

The moderator argued that the transition to a networked knowledge economy accelerates growth in both developed and developing countries, and shortens the timetable for progress to new models of sustainable development.

Environmental sustainability, for instance, will require structural change in life-

styles and business practices throughout the world – which need the commitment of both civil society and the business community to be realized.

This transition, to a networked knowledge economy, also makes the polarization between rich and poor more acute: both by potentially increasing economic polarization through the “digital divide,” and by making such polarization more transparent through wider and easier access to images of prosperity.

In the moderator’s view, current global frameworks that are based on a merely economic focus do not suffice in the eyes of the citizens, anymore. New mechanisms are necessary.

Following these comments from the moderator, the discussion touched upon three areas:

- Self-governance: Can it work?
- The Internet model: Can it be copied?
- Direct democracy: What risks? What benefits?

Self-Governance

The moderator pointed out in the virtual debate that the United Nations and the Organization for Economic Cooperation and Development (OECD) have recognized the need for a more open approach in collaboration with business and civil society. Merely adding consultation with business and civil society organizations into the existing set of inter-government frameworks – i.e., the International Labor Organization, the United Nations Environment Program (UNEP), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Trade Organization, the OECD, the World Bank, the International Monetary Fund, and the Group of Eight (G8) – will complicate and slow down decision-making, and will not help to rationalize the “architecture” of global governance, nor encourage a new “sharing of responsibilities” between governments, business and civil society.

Therefore, the approach he suggested instead is to stimulate self-governance by the international business community, as this is seen as an increasingly valuable and necessary complement to traditional legislative governance by democratic institutions. Nevertheless, he warned that self-governance does not substitute for government policy leadership: it can only complement the policy implementation roles of the judiciary, particularly in extra-territorial issues. The values, objectives and codes-of-practice enforced through self-regulation must

still have the wide public and institutional support provided by open debate and democratic processes. The moderator suggested that the European Union is well placed to give this support through mandates and “recommendations” of the Council of Ministers and the European Parliament – the “Soft-law” instruments – and through the actions of the Commission as intermediary and catalyst for business-led self-governance.

Although many participants agreed with the need for more self-regulation embedded in “soft law,” it was also recognized that the “safe harbor” agreement between the EU and the U.S., often quoted as a positive example, in fact has very few organizations signed up. The latter point calls attention to the fact that a code of practices can only work if many sign up.

The Internet Model

One of the participants noted that most international collaboration is regulated in inter-government treaties. He observed, however, that the Internet is an exception to this. It is an open network set up in 1988 by the U.S. Government.²⁹ The technical aspects of Internet operation have been handled since its inception by a voluntary organization, the Internet Engineering Task Force. In recent years the U.S. government has transferred domain-name authority (i.e., the authority to issue Internet address, which have become an increasingly valuable commodity) to the Internet Corporation for Assigned Names and Numbers (ICANN), a U.S. non-profit corporation and allegedly a non-partisan organization.

Right now the governance of the Internet is under discussion: should the “leaders” of the Internet be elected? And if so, how? This used to be an issue for technicians, but now it has become an issue for politicians, an issue with international significance. For example, at this moment ICANN, a non-profit U.S. corporation, through its domain-name authority can play an important role in the recognition of states (by providing a specific domain name for all of the Internet addresses in that state). Although some new form of governance of the Internet is needed, for this and other reasons, this participant questioned whether elections on who would run the Internet would be a wise path ahead.

²⁹ See <http://www.isoc.org/internet/history/brief.html> for a brief, readable history of the Internet. Its origins date back at least to the first definitions of the ARPAnet in 1966-67. The date 1988 is significant for an open research network because of several events: a series of National Science Foundation (NSF)-initiated conferences at Harvard's Kennedy School of Government on "The Commercialization and Privatization of the Internet;" a National Research Council committee report published that year, titled "Towards a National Research Network;" and the first Interop [i.e., interoperability] trade show was held, in which 50 companies demonstrated IP-based products that interoperated with all of the other products.

There are 400 million users now; this will approach a billion users in a couple of years. Elections can easily be hijacked. And it's clear the Internet needs to be an open system.

This participant expressed the thought that perhaps the authorities and responsibilities currently held by ICANN should be transferred to the International Telecommunications Union in a few years, given that telephony and the Internet will be converging. He also noted that the balance of users on the Internet is changing: most Internet users do not live in the US anymore, and that balance will change even more as time goes on. Today, "dot.gov" is not government, but U.S. government. That and other U.S.-centric features of the Internet need to change.³⁰

The moderator noted that the way Internet affects governance is visible even within the European Commission. Whereas its political transformation was previously externally driven, it is now overtaken by the introduction of email. Collaboration is no longer dependent on location (geographic or organizational) but on needs and interests. Email has been shown to break down hierarchy and sectoral boundaries. According to the moderator, the Internet has the psychology of informality; it captures/transfers messages, etc., and has therefore proven to be a strong driver towards the break down of old systems.

Another participant noted another example that demonstrates how governance can be influenced: the initiative of the United Kingdom in strengthening Internet consultation, in particular involving victims of domestic violence. Women who had suffered from domestic violence were given Internet access and training in the use of the computer, and subsequently participated intensively in the legislative debate.

E-Democracy

The information revolution is creating a new generation of e-citizens, by allowing a more direct exchange between individuals and government. One participant argued, however, that this change could only go so far, adding that if individuals are reduced to customers this does away with the reason for having government at all.

³⁰ However, "need to change" begs the question of "how to change." No suggestions in this regard were proposed during the conference. This is obviously a very important issue with no apparent resolution suggested by the conferees.

Another participant warned that democracy can be a trap in situations where 80% of people cannot read or write. If only 15-25% of the people are ready to use the new tools, you get a new “breakdown” of democracy. This is one more reason not to push for direct democracy using the Internet.

Still another participant admitted that the Internet model is attractive in certain respects, but can be seen as dangerous as well. The Internet is not a “society;” it is not that complex. The original governors of the Internet came from a common culture: Internet enthusiasts, engineers, etc. They were representatives of the earliest users of Internet technology. He also added that when a government puts out a “request for comment” (white paper) to the whole world, often very few people respond. Subsequently government is free to ignore the response.

Education

This discussion began with a presentation focused on education as a sector in which government in Europe is assumed to have a main responsibility. The participant making this presentation recognized that while Europeans view education as a function of government, Americans place a higher emphasis on the individual’s own responsibility. For Europeans, the government’s responsibility also does not end when the individual leaves school, but rather continues throughout a person’s lifetime.

This participant argued that technology can play a very distinct role in educating more people quicker. But reforming the educational system is just as much about increasing funding for teachers as about equipping classes with new technology, he underscored. In some instances, IT can create a digital divide, since children in rich areas are likely to get more exposure to technology than those in poor areas.

In Europe, the traditional “customer” of education has been the institution (i.e., the school), not the student. This is gradually changing, in part because of the information revolution. Some conference participants noted at this point that education is becoming more and more tailor-made for the individual rather than institution-oriented.

There was general agreement among the participants that the Internet creates smarter citizens by offering a wealth of information nearly free of charge. But there was some concern about the need to equip young people with basic skills, rather than just the ability of knowing where to look for information.

The moderator added that at the Stockholm Summit of the European Council, the Commission announced its intention before the end of 2001 to propose additional targets for connecting schools to the Internet, to present a communication promoting on-line dispute resolution systems, and to support eSchola, a Europe-wide initiative to promote the use of new educational technologies and develop on-line course delivery for use in elementary schools (sometimes known as "on-line school twinning").

The first participant warned of the growing difference between the rich and the poor, insofar as IT education is concerned. For example, he noted, in the schools in the United Kingdom, personal computers (PCs) are put in place by richer parents. Richer parents also have PCs at home. This means the balance worsens: children of rich parents get much more opportunities to get acquainted with the new technology.

According to another participant, school is a place to train people to be eCitizens. What do we want them to be; are we training for the right point? A crucial point with a more diffused way of teaching is measurement. How can we know where pupils stand?

Still another participant concluded the discussion with the statement that it is not so much the technology we should change in education, but the content. Technology, in his view, can help. Today's education system is in many ways obsolete, since it is still based on the assumption that what people learn in this first period of their lives will satisfy their needs for the rest of their lives. Since the knowledge cycles have become so much shorter, education must now be continuous, and therefore the "head start" conception should be rethought. Our brains will in the future no longer be a knowledge container, but a knowledge-gathering mechanism. Being ready for that is the task of new education. If the present institutions stay the same (even with more technology tools) there will be a problem.

7. The Security Dimension of the Information Revolution

Moderator: Thomas Köppel

Rapporteur: Michelle Norgate

The next session of the conference discussed the security dimension of the information revolution. It focused primarily on the conflict between the need to police the Internet to detect crimes and users' simultaneous demand for privacy; on the extent to which businesses are aware of security risks; and on the effectiveness of national and international laws regarding cyber crime. The session began with a short presentation by the moderator on security risks to IT infrastructures, followed by a summary of the virtual conference. This was followed by an audience discussion.

Security Risks to IT Infrastructures

The moderator began by noting that in many organizations IT security is often considered only as an afterthought. While technical advances in terms of processor speed, Internet integration, and storage space are increasing the functionalities of IT systems exponentially, IT security often lags behind. Yet organizations that underestimate IT security fail to recognize that security is a prerequisite of trust, and we may well ask at what point it will become a serious issue for such organizations. Although IT security has caused some discussion in the media in the recent past, it has been reported mainly for its "spectacle factor," and it will likely take a major incident – an "electronic Pearl Harbor" – before the awareness of such organizations is raised to the extent that they realize that IT security is vital.

The moderator went on to describe two components – actions and actors – involved in security threats to IT systems.

The actions involved in security threats to IT systems can be physical attacks, electronic attacks, or psychological attacks, as indicated in Figure 7.1.

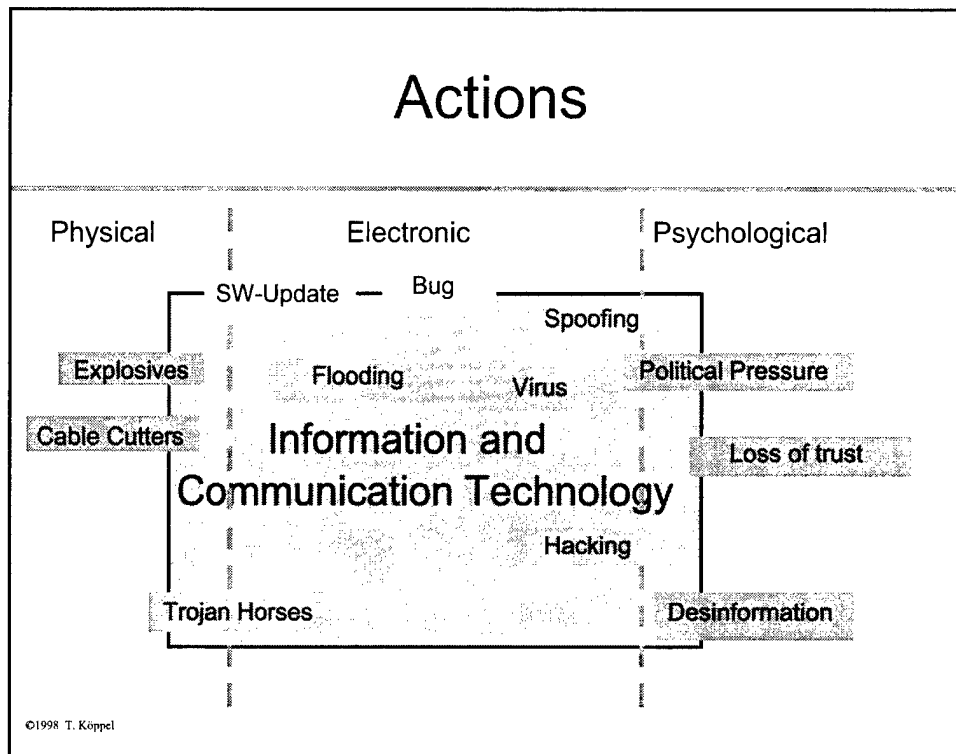
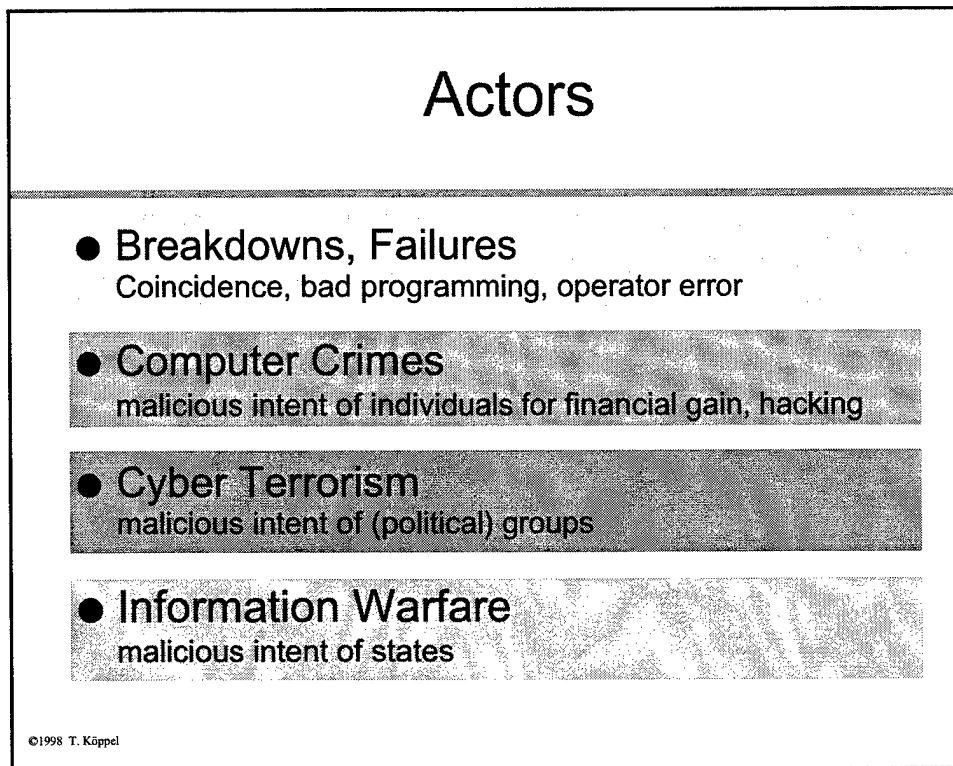


Figure 7.1 Actions Involved in Security Threats to IT Systems

The actors of IT security breaches can be divided into various levels, as indicated in Figure 7.2.

The speaker emphasized that, in general, the current level of security against such actions and actors is low. One problem is that many operating systems use negative security (for example, all ports are open by default until a certain feature is disabled), despite the fact that the implementation of positive security (i.e. all ports are closed by default until opened) could easily be achieved.



10

Figure 7.2 Actors Involved in Security Threats to IT Systems

Summary of the Virtual Conference

The moderator summed up the topics discussed during the virtual conference:

- One participant presented a paper with 20 negative points on technical issues in current IT security.
- User training was generally found to be poor at present.
- One part of the discussion looked at whether self-policing on the Internet is working, or whether we need an "Internet police." Participants also questioned whether policing Internet traffic was, indeed, possible, for if a peer-to-peer model is the way of the future (as some have suggested), there can be no central control.
- International and national laws (for example, those of the U.S., the EU, and Switzerland) are incompatible and must be considered a potential factor in destroying confidence among Internet users. The question was raised of

how much damage would need to occur before confidence was irreparably damaged.

The Discussion

Two Internets

Following on from the moderator's presentation, one participant suggested that to ensure security and simultaneous openness (as appears to be the main aim), we could have two Internets, one openly available to all, and one secure, with a limited number of users.

Several participants believed that a distinction between networks is indeed possible, saying that encryption, which the next Internet protocol will support, allows for such a distinction. Also, private networks were, after all, the beginning of the Internet and should consequently still be possible.³¹

Other participants doubted whether such a distinction is possible. One noted that we need to be clear whether we mean two logical or two physical networks, and physical differentiation is probably no longer possible. Even if firewalls are perfectly administered, no firewall approaches the security of air gapping. Another added that the power of the Internet resides in its inclusiveness. Also, we should bear in mind that no security system depends on one thing alone. To ensure security, we therefore need to mix physical, social, and technical solutions.

One participant noted that current trends in business will make the separation between networks increasingly difficult due to outsourcing. Data belonging to many companies are stored at data centers and are often mixed. Physical separation of such data is not feasible, so storage systems need to be able to be adequately compartmentalized. Further, mobility is demanded by users, who increasingly wish to carry their data with them at all times. The fact that data travel and are cached makes security a much more complicated issue.

Finally, one participant suggested that there are other ways of ensuring security on multiple levels. It is not a question of why we do not have two networks.

³¹ "Private networks" would most likely use the Internet Protocol (IP) and its related systems and services, but are distinct from, and not connected to, the Internet – with the possible exception of a small number of carefully monitored and controlled gateways. Private networks are distinguished from "virtual private networks" (VPNs) that encrypt communications and "tunnel" through the Internet without allowing their content to be viewed or accessed enroute.

Rather, we do not know why we have one: the Internet was not planned in the first place. One problem with the Internet is that security is fought by the system, since it was designed as an open system. This is not the case with other traffic media: if there is a car accident, help can arrive through other means, e.g. a fire engine. (Also, unlike cars, PCs are not security tested.) With the Internet, the cables are the problem. If there is an accident somewhere within the communication system, we hope that there will be alternative media to transmit and receive data, for example satellites. Multiplicity of access is therefore the key.

National and International Laws

Referring back to the virtual conference and the question regarding legal issues and security, participants pointed out that although regulations can be imposed indirectly, companies also need to take responsibility for protecting themselves. As far as international law (e.g., the Council of Europe Convention on Cyber Crime) goes at present, cyber crime includes many diverse crimes, for example, cracking and pedophilia.³² Yet there is a basic difference between the two crimes: while cracking has only become possible since the emergence of computers and related technology, pedophilia already existed before and was dealt with in national and international law long before the emergence of the Internet. Pedophilia was included in cyber crime legislation because the Internet has opened up new, international channels for this old crime. Laws against pedophiles are therefore clearer and better established than the newer, less clearly defined (and definable) cyber crimes involving modern IT. Also, it should be noted that some national laws go further in controlling and punishing cyber crime than international law. In Italian law, for example, if someone takes down a publicly used system, he/she is committing a crime because he/she is hampering access to another of many (mainly pre-IT) public systems. Further, in the new IT environment, privacy becomes an issue. In order to catch pedophiles, police need to monitor traffic from ISPs. So how do we protect our privacy in the future?

One participant emphasized the difference between hackers, who write code, and crackers, who break into systems. However, even "white hat" hackers are

³² "Cracking" is a term commonly used by computer professionals to denote the act of breaking into a computer system for which one does not have authorized access. Such access may also cause damage, intentionally or unintentionally. This terminology distinguishes these acts from "hacking," which is often viewed as a creative acts of computer programming, often to uncover or exploit some novel feature of an information system, and most often with no malicious intent. A "cracker" is a person who engages in "cracking," just as a "hacker" is one who engages in "hacking."

not always benign. One example was the "I love you" virus that started as a student exercise and then spun out of control. With regard to such security breaches, we need to establish rules that determine where the line between government responsibility and individual action lies. Further, security is a matter of public trust. Another participant agreed, emphasizing that in the public domain individual responsibility is as important as government responsibility. In the case of the "I love you" virus, if no individual had opened attachments to emails from unknown senders, the virus would not have been a problem.

Another participant suggested that trust, not (self-)protection, is the central element. People who start using the Internet to purchase goods go through a threshold of trust: first, they buy nothing, and then they buy excessively and are lured into careless behavior.

With regard to pedophilia, one participant pointed out that possession of incriminating information is not a crime in the US, but the transmission or passing on of information is. Another participant agreed, saying that ownership of illegal information or material is decisive and not the act of looking at it, for example, on the Internet. With many forms of cyber crimes, prosecution is difficult and hampered by geographical distance. Further, there is a lack of legal clarity regarding computer crimes. Consequently, there can be no deterrent because there is no conclusive law.

Another participant noted that a clear distinction between crimes of unauthorized access and crimes of access denial is necessary. Finally, still another participant suggested that we should not count on officials to create laws at the same time as technological advances emerge. Rather, laws are by nature always made after the arrival and implementation of a new technological development.

Policing versus Privacy

Picking up on the users' demand for privacy and the simultaneous need of police to monitor ISPs to gather evidence against criminals, one participant said there is a general assumption that Internet security is a good thing. However, in the case of the police service, this is not so. Police want their own secure system, but they also want access to information posted on the Internet or read by (potential) criminals, for example, pedophiles. In other words, police want the key but do

not want others to have it also. The Echelon issue is a case in point:³³ it is in the national interest that the U.S. can see everybody else's information, but if that is possible, then others will also be able to see US information. Internet banking is another example: according to customers, it must be safe and highly confidential. However, police would like access to evidence regarding possible acts of money laundering. There can be no easy solution to this conundrum.

One participant agreed, saying that people want both security and the comfort of open access. The government may desire and indeed have a secure network, but for business, information and entertainment purposes, open access is vital. Several questions arise from this conflict: Who is responsible for security, the individual, the law enforcement agencies, or the legislators? How should companies and organizations share information, and what sort of information are businesses prepared to share with each other for the sake of security? How do they benefit from the experiences of others regarding security without losing their market advantage?

One participant responded that the issue is not one of absolute openness versus pure anonymity: neither is possible. Rather, security is a psychological problem. Humans see what they want to see and forget what they want to forget. So, for example, we live with the fact that thousands of people die each year in road deaths – the biggest cause of death by accident in the world. Yet we continue to sell cars without improving the security aspects. We now are even preparing to sell huge numbers of cars to China, where there are regular bicycle jams.

Another participant agreed that it is not a question of exclusive openness versus exclusive anonymity. Rather, individuals need to speak anonymously at some times, while at other times they do not. Privacy becomes a major issue in the trade-off between secure and open systems. Further, each time there is technical development that improves security, there is a technical countermeasure to undermine it.

IT Security in Business

One participant reminded the conference that we should not lose sight of the positive aspects of IT. For example, with conventional mail and faxes, senders cannot know whether their messages have reached the recipient. E-mail gives greater assurance because email delivery is much more reliable. Regarding

³³ Recently, there has been considerably European Parliament and media attention focused on a supposed U.S. National Security Agency-led "Echelon" system allegedly used to spy on European communications. This is, in European eyes, the "Echelon issue."

security, most people who use credit cards to pay for goods purchased online have no problems. Using faxes and telephones is as risky as using the Internet for purchasing purposes.

Raising the question as to whether security in business has improved over the past 10 years, one participant described how in the early to mid-1990s RAND looked at security in cyberspace. Security arrangements in various companies were found to be seriously lacking. In particular, RAND's study found:

- Security is not solely a technical problem. Some good technological solutions are available, but most IT systems are not using such solutions. Security is often not seen as a serious concern by most users.
- There exists a disparity between functionality and security. When forced to choose, users almost always prefer better functionality to better security. For example, when a firewall is installed, technical staff have to decide what to let in and what to keep out. The study found that letting in ASCII email was the least risky, and letting in executable code from strangers was the most risky. Yet despite the fact that this has become common knowledge, nowadays we let in executable code from strangers on a regular basis.
- At a 1996 RAND-Ditchley Foundation conference,³⁴ it was found that companies, individuals, and society as a whole would not take security seriously until a disaster occurred. One famous example was an electronic bank robbery at Citibank in the early 1990s. Even then, the incident was termed a disaster by Citibank not because of the amount of money lost but because: (a) bank personnel didn't discover the loss, some of their customers told them about it; and (b) the bank feared a loss of customer confidence. Citibank worried about these aspects of the incident much more than about the amount of money lost. Before this incident, computer security was a quarterly audit function at Citibank. After the incident, however, Citibank set up a 24-hour, 7-day surveillance system.

The participant said that 10 years after the RAND study, companies still choose functionality over security. Banks have become more aware of security issues, but smaller companies and computer companies have not changed their attitudes towards security.

Another participant suggested that threat analysis and risk management are key. Content providers and users have matured since Citibank's experience, and with

³⁴ See Hundley et al (1996).

the Y2K issue people have begun to look on the Internet as a phenomenon that is here to stay. Y2K also highlighted how dependent we have become on IT. We now need to gauge security risks and needs, and assess the effect of security on companies. The level of security that companies and organizations implement should be consistent with the users' needs, and user trust is the key. As we saw with Citibank, the threat of a company's loss of reputation is often a far greater concern than the threat of a financial loss.

One participant noted that the sharing of information, especially information relating to security, is inhibited due to companies' fears that their vulnerabilities may be exposed. However, sharing information is vital, and the participant raised the issue of how this fear of exposure can be overcome. Another participant responded that companies who share security information are not compelled to make sensitive information openly available. Rather, they can share information with selected counterparts (for example, with the police after a security breach), and the information they share can be made anonymous and can be sanitized. Such sharing of vital security information should be seen as mutual collaboration, not as the giving away of company secrets. However, getting companies to collaborate, getting information from them, and assessing damage done to them remains problematic.

Future Developments

One participant noted that Asia, the sub-Saharan continent and South America will have a huge effect on the Internet when they come online fully in the near future. They are looking to the Western world, hoping to share our experience and hoping for help with good practice. We need to consider what our (the US's Europe's, and Canada's) advice to them will be. One participant responded that there was the Manhattan cyberspace initiative to help with these issues, but it is no longer in existence. One important factor is that education about security must start in schools. Also, we might alert the public to the fact that there is always a price for security, and that while general physical security is usually excellent, at the same time IT security – especially in small companies – is underestimated and lags behind physical security to a significant extent.

Another participant noted that while the use of IT in the public sector is widespread today, it is often difficult to find security experts for the public sector, since wages are usually lower than in the private sector. In addition, the migration of qualified specialists from east to west and south to north is causing problems. To ensure security a complex implementation of PKI (public key infrastructure) is needed. The problems caused by a lack of security, and by a

lack of specialists to ensure security, are complex. Further, outsourcing mission-critical functions is problematic, as, indeed, is defining the difference between mission-critical and non-critical functions. A final point the participant made was that most attacks (around 70%) on computer systems still come from within, so it is necessary to educate people in fairness and trust.

Another participant agreed, noting that the focus now should be on building trust in software security systems. Security was once costly, cumbersome, and/or impractical, but this is no longer true. We now need to change people's attitudes, so they recognize that security is part of overall quality. Banks understand risk management; now other users have to realize that there is always a risk and that security is an important feature of the quality provided by companies. This participant suggested that it might be time that data protection becomes an essential legal requirement. This could be legally implemented, for example, in such a way that companies are prosecuted, if they do not protect data adequately.

Part II.
Some Deeper Looks

8. Variations in the Information Revolution across Europe

Discussion Leader and Rapporteur: Tora Bikson

A break-out group comprising conference participants from a range of European countries (including EU members, future accession countries, and others) was charged with the task of exploring future variations in the course of the information revolution throughout Europe. In particular, the group was asked to consider whether the information revolution was likely to result in increased homogeneity across Europe or, if not, what would account for the diversity. Further, the group was asked to discuss what light its findings might shed on the adequacy of proposed country models for explaining key variations in the information revolution globally.³⁵

The group addressed its main charge with vigor, while also taking into account in its deliberations some contrasts between the shape of the information revolution in Europe vs. the United States. The chief themes emerging from this break-out session are described below.

History and Context

There will be notable variations in the nature and course of the information revolution in Europe, in part reflecting each country's social ties, history of legal and regulatory policy, the relative roles played by military versus civilian development of technology, and many other historical factors. As an illustration, participants suggested that Spain and Portugal are likely to have closer ties in the long run to South America than the United States will, an enlarged NAFTA notwithstanding. That is, cultural affinity will likely outweigh geography over time in the global information society. On this basis, the group predicted the revitalization of historic global partnerships in the future course of the information revolution in Europe and beyond it.

³⁵ See Hundley (2001).

At the same time, current influence relationships (e.g., nonformal power structures, countries recognized as role models, positions of particular state governments within regions, and other contextual factors) will also have a bearing on the shape and direction of the information revolution across Europe. The Nordic countries, for example, are taken as information revolution role models throughout Europe and more broadly. Moreover, their current position – along with historic ties – enables them to speed the transition of their Baltic neighbors to the information society.

Finally, EU membership and prospective accession are having a huge effect in Europe, even among countries not in line for accession. In particular this alliance is accelerating the adoption of common legislation related to the emergence of e-government, e-commerce, and the information society. Concurrently, a central EU serves as a buffer that permits individual states to flourish and pursue their own course in the information revolution. EU membership, for instance, made Ireland separate from Great Britain, and this accounts in large measure for Ireland's progress now.

Against this discussion of high-level background influences on similarities and differences in the European information society of the future, several more specific historic and contextual factors were singled out for attention. They are reflected in what follows.

Education

Educational attainment levels in science, mathematics and technical areas – even among high school graduates – are higher in Eastern Europe and Russia than in Western Europe. The former countries are hampered by a lack of infrastructure, hardware and reliable networks; but in projects where these have been provided, they have had the human resources required to maintain and make use of them. The legacy of communism will surely give the information revolution a different shape in Eastern European countries. But the prospect of leap-frogging and escaping economic austerity, together with the availability of strong IT expertise in the workforce, may motivate them to move ahead very quickly.

Role of Women

In Northern and Eastern European countries, women have traditionally been well educated and there have been comparatively few barriers to their entry into scientific and technical fields. Further, women in these countries have historically been socialized to expect that they, like their male counterparts, will

be productive members of the employed labor force. Thus these countries (in contrast to southern Europe, which has much lower rates of work force participation by women) can count on large proportions of their populations being well prepared for a knowledge-based economy grounded in information technology.

Some participants additionally pointed out that computer-based group work has been shown to be more gender-egalitarian than comparable face-to-face group work. Others noted that, in fact, women may well have stronger roles in the new economy than men if indeed women are more communicative and more collaborative than their male peers.

Geographic Mobility

Assessing the current and future status of geographic mobility across Europe in relation to the information revolution is complicated. Participants believe that geographic mobility in Europe is probably underestimated, especially in higher income strata. On the other hand, available data suggest that, in the aggregate, the proportion of people working outside their home country has declined for Europe as whole in recent years – from 4.5 percent formerly to about 3 percent now. By contrast, 25 to 30 percent of U.S. citizens have moved from their state of origin (although this may not be an apt comparison because changing to a different state of residence in the U.S. is less complex legally and linguistically than changing one's country of residence in Europe).

The European data probably reflect the fact that, because of economic integration, there is less need now for economic migration. Participants called attention in particular to the improved economies of Greece, Spain and Ireland. The assumption is that people would prefer to stay in their own cultural/linguistic communities where that is an economically viable option. Thus, to the extent that the information revolution improves the economy and enables telework, break-out group participants expect that utilitarian travel should be reduced. On the other hand, these same phenomena may bring increased mobility among IT experts as well as increased travel for experience purposes among others.

Investment in Research

In general, participants believe that fundamental research has decreased (in both Europe and the U.S.) but that applied research has increased. This is problematic in the long run because fundamental research is "the fountain" of future

applications. It is therefore important to have a culture that values and gives high status to fundamental research. Northern and Eastern Europe are stronger in this regard than Southern Europe or the U.S. In the near term, however, applied research has more direct influence on the course of the information revolution.

Government-funded research will be the driver of high-bandwidth networking in Europe. The U.S., in contrast, emphasizes the role of the private sector in research and development, which leads to its present focus on applied efforts. Europe will most likely try to keep up its public investment in fundamental research, which could give it a long-term advantage in the information revolution.

The "New Economy"

It is important to understand that the EU focus on the information society is concerned primarily with fostering economic growth in the "new economy," using new technologies as enablers. At present in Europe, there is probably still no overall correlation between the information revolution and GDP growth rates. As cases in point, participants cited Spain and France, which will have the highest economic growth rates yet the lowest IT penetration rates in Europe. It remains an article of faith that the knowledge economy will increase GDP.

Expected GDP increases are, moreover, likely to be mediated by a number of other factors (which is why there is no direct causal relationship between IT penetration and economic growth). For example, participants noted that the egalitarian, nonhierarchical, participatory culture of Nordic countries made the take-up of self-managed telework go faster there. More generally, participants felt that the knowledge economy is quite different from industrial capitalism, with value being created through interrelationships and collaboration, rather than through accumulation and competition. Cultures that reward the former are most likely to flourish in the "new economy."³⁶

Civilization and Culture

When asked whether the information revolution is likely to increase similarity or increase diversity across Europe, break-out group participants answered "yes" to both. The key to this seemingly paradoxical response lies in the distinction

³⁶ However, others noted that competition will still have a role to play in the "new economy."

between civilization and culture. That is, participants suggested that Europe is moving toward global civilization but not toward global culture.

Civilization, from this perspective, may be viewed as the common infrastructure for diverse cultures. Civilization includes a stable framework of laws and institutions as well as a shared body of information and knowledge:

- Harmonized laws and institutions allow regional and local differences to flourish without becoming barriers to productive interaction.
- While we speak of IT-enabled knowledge-based economies, it is important to understand that it is culture which creates meaning and context for abstract information. Knowledge as embedded in a culture is what leads to innovation and implementation.

Further, relationships between the information revolution and the diverse cultures of Europe are reciprocal rather than unidirectional. Culture is critical to the interpretation and deployment of IT; but IT is also changing the culture, as is already evident in music, literature and art. Moreover, individual creativity will be stimulated by the rich intellectual and cultural resources to which networked technologies give access. And greater diversity, in turn, is expected to be a benefit in a knowledge-based economy (where there is little value added if everyone brings the same information and ability to the network).

The resulting picture, then, is one in which common legal frameworks and institutions as well as shared information and knowledge promote diversity and creativity in implementation and use. Thus the information revolution will stimulate greater homogeneity in the infrastructure of civilization while enhancing the heterogeneity of cultures.

Country Models

The break-out group then addressed questions about the extent to which proposed "country models"³⁷ are helpful for understanding variations in the course of the information revolution in Europe or elsewhere. Participants generally viewed the models to be not sufficiently useful, in their present form, for understanding these differences. Their comments and recommendations are outlined below.

³⁷ See Hundley (2001).

First, instead of aggregate characterizations, the models need to be multidimensional. They should incorporate a number of different benchmarks or key indicators of information society status. This is important because any given country might rank high on some measures and low on others (relative rates of cellular penetration in Europe vs. the U.S. were cited as examples); and rates of progress on different indicators may vary as well.

Next, participants questioned the usefulness of the kinds of indicators on which the present models are based. Good indicators, they argued, are those that will reflect the social and organizational changes associated with transition to and growth of the new knowledge economy:

- Penetration rates for various technologies are, for this purpose, too superficial to use as information revolution indicators. They are also too susceptible to short-term change to have much predictive value, although it might be useful to take a look at the current front runners on these measures to see whether any common factors emerge.
- Better indicators would include, for example, rate of transition to telework, rate of participation in knowledge work, and proportion of the labor force with knowledge-work skills and educational attainments. Benchmarks of this type will have longer-term predictive and explanatory value.

Third, participants were not convinced that "country" is the most appropriate unit of analysis (in contrast, for example, to individuals, organizations or cultures). On the one hand, it is easier to establish connections between information revolution progress indicators and outcomes in organizations or firms (or their members) rather than for entire countries. Typically, positive outcomes are mediated by nonhierarchical, participative styles that promote self-managed knowledge work (see above); but the same technologies, when deployed in authoritarian hierarchical organizations, do not produce the same outcomes. Thus it is difficult to examine the influence of IT when aggregated across firms to the country level. On the other hand, when looking for large patterns of effect, national boundaries in particular and even entire geographic regions probably make less sense than aggregations defined by close cultural ties.

Closing Observations

Break-out group participants ended the session by generating some concluding points and some open questions about the course of the information revolution in Europe. They are itemized briefly here.

Information Revolution Boosters for Europe

- Liberalizing the costs of telecommunications.
- Making the infrastructure widely available and reliable.
- Enabling small and medium-sized enterprises to exploit the infrastructure.
- Having widely shared hardware requirements and standards (perceived as a benefit to both providers and users).
- Development of software and contents that overcome local language barriers.

Information Revolution Questions

- Can the major presence of the United States in the information revolution lead to the Americanization (and thus to the greater homogenization) of Europe?
- Does the origin of the Internet in the United States have any effect on the future of the information revolution?

9. Differences Between the United States and Europe and Their Effects on Utilization and Consequences of Information Technology

Discussion Leader: Horace Mitchell

Rapporteur: C. Richard Neu

During the plenary sessions of the conference, considerable attention was focused on differences – economic, social, demographic, political, and policy – between Western Europe and the United States and on how these differences might affect the course and the consequences of the information revolution in the two areas. Because these differences are numerous and their potential consequences profound, one of the breakout groups sought to consider these differences more carefully.

Discussions in the breakout group illuminated key differences between the European and American environments in which information technology is developing and diffusing. Interestingly, these discussions also revealed some telling differences among participants *about these differences*. In important respects, Americans and Europeans do not perceive themselves the same way that those from the other side of the Atlantic do. There was also considerable difference of opinion among the European members of the breakout group.

Topics for Consideration

The session began with the discussion leader listing what he saw as some differences between the United States and Europe that may be key. Among these were:

- Differences in relative wealth and income.
- Propensity to change and the ease with which change can be accomplished.
- Demographic and geographical differences; differences in the “built environment” (e.g., the much higher population densities of Europe).

- Societal values: individualism versus collectivism; individual versus social responsibility; determinants of status and prestige.
- Degree of social and cultural homogeneity and coherence: fractionation along linguistic, ethnic, cultural, social, behavioral lines.
- Roles and popular perceptions of governments.
- Approaches to education and educational attainment.

Other members of the group identified other potentially important dimensions of difference between Europe and the United States:

- Financial systems.
- Attitudes regarding and laws governing liability.
- Labor laws and the operation of labor markets.
- Attitudes toward and laws relating to bankruptcy.
- The level and character of taxation.
- Practices and laws affecting corporate governance.
- Lifestyle differences.
- The United States' status as a unitary nation while the EU remains a loose confederation.
- Immigration policies, the ease of assimilation, and willingness to accept immigrants.
- Military power.
- Relations to the rest of the world.

Controversy arose over some alleged differences. Members of the group debated, for example, whether firms can meaningfully be identified as "American" or "European." Some members (interestingly, mostly American) rejected such distinctions, arguing that large firms today are inherently transnational, pursuing operations, marketing their products, and recruiting their staff from many countries. These participants saw different managerial styles as reflecting the idiosyncrasies of particular companies rather than national tendencies. Others (mostly Europeans) insisted that some firms are distinctly American or European in style and in the control that governments may exercise over them. A further disagreement arose among those who found the distinction between American and European firms as meaningful over whether business practices and management styles of the two kinds of firms were converging.

Some argued that global approaches to business would eventually be adopted by all firms. Others insisted that important differences – especially with regard to information technology – persist today and show no sign of disappearing. A key example of the latter is an allegedly non-narrowing gap between the amount being invested in information technology by “American” and “European” firms. No consensus was reached on these issues.

The Discussion

The list of potentially important differences identified was much too long for each to be considered in detail by the group, and conversation jumped around from topic to topic. The following summary of points reflects the somewhat disjointed character of these discussions.

There was general agreement that differences in wealth and income between the United States and Europe are probably insignificant in determining the course and consequences of the information revolution. Group members noted, however, that although income and wealth *levels* are similar in the United States and Europe, their *distributions* are not. This led to some interesting speculation about whether a few very rich individuals can act as technological trend-setters, adopting new technologies early on when these technologies are very expensive or providing early markets for new technology-related products or services and thus pulling the entire society along the path of technological innovation. Most of the group found this idea unconvincing.

Considerable discussion focused on demographic differences between Europe and the United States. There was general agreement that Europe’s relatively old and rapidly aging population may result in future shortages of at least some kinds of labor and difficulties for government-managed pension schemes. There was also general recognition that European resistance to immigration would further exacerbate these problems. Enlargement of the EU may alleviate some of these problems, since accession countries tend to have larger young populations than do current EU members. Some members of the group looked for additional relief in “virtual migration” – foreign workers who, with the aid of advanced communications technologies, could meet some of Europe’s labor needs while remaining in their home countries. While other group members recognized the possibility of such “virtual migration,” they were skeptical that this could take place on a scale necessary to get Europe out of its demographic bind. Most group members rejected the notion – advanced by some – that “virtual immigrants” could be compelled or persuaded to pay into already-tottering European state-managed pension schemes.

Some members of the group advanced the idea that information and communication technology (ICT) development and exploitation in Europe is limited today principally by a shortage of suitably skilled labor. This idea met with general acceptance. Most of the group were skeptical, however, about assertions that EU enlargement would ease this particular labor constraint.

Others in the group suggested that aging of the European population – particularly the aging of the current generation of relatively computer-savvy professionals – will produce increased demand for services facilitated by information technology as the future elderly seek ways to accomplish more while traveling less.

Some group members pointed out, however, that the generation that will do the most to shape the course of the information revolution in Europe – today's young people – was not represented at this conference. Conference participants, they asserted, know little about the attitudes of young people towards information technology, work, or society. There was deep disagreement about whether the younger generation of Europeans will become (or already are) more like their American contemporaries than their elders are or will be.

Discussions in the breakout group generally underlined assertions made in plenary sessions that Europeans are more risk-averse than Americans when facing business or social innovation. Europeans, most group members agreed, show a penchant for long-term planning that Americans do not share. The rapid change in economic and social relations that has been facilitated by advances in information technology has, however, undermined efforts at long-term planning, bringing more discomfiture in Europe than in America. In an amusing aside, one European cautioned against a blanket conclusion that Europeans are incapable of embracing rapid technological change. He pointed to the more rapid spread of mobile telephony in Europe than in the United States. An American archly observed that if Europeans considered the switch from fixed to mobile telephony to be a major technological transformation, then Europe's difficulties with technological change must be very great indeed.

In discussing societal values, group members characterized Americans as being more tolerant of risk and uncertainty than Europeans, more focused on material success, and perhaps more single-minded (some said ruthless) in the pursuit of business goals. However attractive or unattractive these traits may be, the group generally agreed that American attitudes are more conducive to aggressive exploitation of new information technologies than are European attitudes. European group members characterized themselves and their compatriots as tempering their pursuit of material gain with a fundamental attachment to

economic and social equality. American participants recognized this difference in social aspirations, but at least one American suggested that, in addition to economic gain, many Americans place a high value on individual freedom, the chance simply to be left alone.

Group discussions also identified a European hope that the spread of new information and communications technologies might allow an "immaterialization" of economic activities. People may, for example, be able to interact with each other at a distance or enjoy art and culture from their homes, thus reducing the need to travel and the attendant consequences for the environment. While recognizing such possibilities, other group members countered that, to date, increased opportunities to communicate and to learn about what the world has to offer has, if anything, increased physical travel. There was more consensus about the possibility that advanced information technology will allow improved tracking of many products (automobiles, household appliances, and IT devices themselves) to guarantee that they are recycled properly at the end of their useful lives.

The group recognized that Europeans seem to have more faith in governmental institutions and to accord more prestige or respect to government officials than do Americans. Europeans are consequently more comfortable with the idea of governments' playing a key role in guiding the development and adoption of information technology than are Americans. Indeed, European group members stressed the efficacy of "signals" provided by governments to direct developments in fast-changing markets and to speed standardization.

Group discussions did reveal, though, a curious difference of perception between Americans and European members of the group regarding the actual activities of particular governments. European members of the group seemed generally to believe that the U.S. government "conspires" (as one European member put it) with U.S. companies to perpetuate U.S. domination of information technology markets. In this view, European governments "crucify" (in the same colorful language) European firms – failing, for example, to provide support for research and development, and insisting on destructive competitive tenders for all products and services purchased by the government. (Needless to say, American members of the group found this characterization considerably exaggerated.) Because European governments do not support R&D, these European commentators concluded, European suppliers of information technology and services are likely to fall behind their American competitors. (Mobile telephony is a striking counterexample to this proposition.) Nonetheless, some European members of the group suggested that experience in Europe's multi-language and multi-cultural markets may give European firms a leg up over American firms in

selling IT products and services in Asia and the Middle East. Other group members saw the fractionated European market as placing European firms at a distinct disadvantage when they try to grow beyond initial small-scale operations. Rather than exploiting potential competitive advantages in Asia or the Middle East, these commentators argued, European start-ups will generally see the United States as the logical “second market.”

One commentator noted that Europe may face some severe disadvantages in developing information technology products and services because some of the sectors where IT can be most transformative are in Europe “trapped” within the public sector or heavily regulated. This commentator, suggested, for example, that education and health are sectors that could produce dramatic advances in the use of IT. In Europe, however, health and educational services are provided almost exclusively through the public sector. There is little competitive pressure and thus little incentive to innovate. Finance is another sector where IT can play a key role. The much less regulated and more highly competitive financial markets of the United States are likely to provide a more fertile field for IT innovation.

10. The “Dark Side” of the Information Revolution

Discussion Leader: Ian Pearson

Rapporteur: Robert Anderson

Most of the overall conference discussion focused on forms, effects and benefits of the continuing information revolution. However, it was felt important by many participants that the “dark side” of the information revolution be discussed for balance and perspective. As with other sessions, possible unique impacts and distinctions from a European perspective were emphasized.

“Dark Side” Scenarios

The session moderator led off with a list of potential pessimistic scenarios, taken mainly from British Telecom planning exercise scenarios of the future with which he was directly involved. His list of examples included:

- Artificial intelligence causes major social stresses, primarily as jobs are automated, forcing people to retrain and possibly lose some of their status.
- Increasing societal and individual dependence on computers and communication systems makes such systems a specific target for attack.
- The increasing complexity of networks leads to more catastrophic failures. It is probably the case that no one understands the full complexity and interdependencies of the networks we are currently building.
- Hardware and software become self-replicating, and cause a chain reaction that is out of control. A recent article by Bill Joy in Wired Magazine has been widely cited and discussed in this regard.³⁸
- Peer-to-peer (P2P) software and genetic algorithms allow software to evolve and spread rapidly, again perhaps becoming out of control and no longer understandable by humans.

³⁸ See Joy (2000)

- The developed world's growing dependence on computers and information networks creates an asymmetry compared with other regions and cultures. We are more vulnerable in this area.
- The increasing sophistication of robotics, coupled with software advances (e.g., in artificial intelligence and speech understanding) removes jobs from the marketplace, both in low-skilled, entry-level positions and more sophisticated specialties.
- An increasing amount of data is compiled on our individual buying habits, cellphone usage patterns, credit card purchases, and so on. Dossiers are compiled that reduce our privacy.

Needless to say, this "starter set" of issues provoked animated discussion. Some questioned whether there were really perpetrators for all these dark-side activities. Another commentator said that our societies may fall back on more locality and less global interdependence. This would be a deliberate backing-off from extreme uses of technology. (The European outcry against large-scale "industrial" farming after the spread of foot-and-mouth disease and bovine spongiform encephalitis ("mad cow" disease) is one indication that such trends might occur.)

Another comment stressed that as online groups expand, the average distance to someone else with similar interests decreases, so the odds increase that you may find someone in your locality with whom you wish to communicate – another instance of localism perhaps reasserting itself over globalism.

Distinguishing Reliability/Complexity Issues from Intentional Misuse

It was stated that two different topics were intermingled in the above discussion: (1) reliability and complexity of systems; and (2) intentional misuse of systems. On the former topic, one participant stressed that complexity in itself doesn't lead to danger; he pointed to the Boeing 747 as an amazingly complex, yet reliable, set of interrelated machinery and systems.

Regarding deliberate or intentional misuse of, or attack upon, systems, one commentator cited the "HoneyNet" project in Canada: When they put a new computer onto the Internet, it took only an average of eight hours until there was an intrusion. Other misuses cited by participants included:

- Use of the Internet as a communication medium to coordinate attacks, both physical and in cyberspace. Massive denial of service attacks so coordinated can cause havoc; one participant used as an example the generation of tens of thousands of "Freedom of Information Act" (FOIA) requests, which would tie up the resources of any particular government agency.
- Psychological operations, in which digital images on the net are manipulated (e.g., turning a smile into a smirk or scowl) to harm politicians or other public figures.
- Deliberate placing of misinformation could become a subtle danger. Increasingly, people rely on such information gathered in quick Web searches, rather than carefully checking sources and origins of information.

In addition to such misuse, there may be more subtle dangers. Consider "virtual reality" becoming ever more realistic, to the extent that it's indistinct from reality. Children and impressionable people may not distinguish "avatars" and other representations in cyberspace from reality. The result might be a reduction in their inhibitions and an increase in anti-social behavior in the real world (issues similar to complaints about TV programming) – or groups of people might form that prefer such artificial realities to the real one, also thereby leading to unsocial behaviors.

The "Dark Side" and Europe

The discussion turned to some unique aspects of Europe regarding such "dark side" scenarios and issues. Some characteristics of Europe that may affect how dark side issues play out here were listed by various participants:

- In Europe, there are multiple jurisdictions, leading to more complex issues dealing with regulation of cyberspace. At times, there may be a lack of cooperation among the various law enforcement agencies.
- It was mentioned that there remains quite a bit of "tribalism" in Europe that could be exploited by malefactors.
- Although we speak glibly of the "information revolution," the word "revolution" has additional meanings and overtones in Europe; it's a loaded word, which may further alienate various citizens from this new revolution.
- There are issues of trust and dependence. The European Union is worried about its increasing need to trust systems built (or integrated) in the United States (e.g., by Microsoft, Intel, Cisco, ...) on which its critical infrastructures depend. Recent publicity about a possible U.S. National Security Agency-led

“Echelon” system used to spy on European communications has contributed to a level of distrust of US systems. Europeans wonder if deliberate security “back doors,” limitations, or flaws are built into US systems to make such reconnaissance easier. (As an example of such ploys, there was mention of a discovery that Lotus Notes uses only 40 of a possible 64 bits of encryption.) Such fears could be played upon by others to create mistrust among various European armed forces, for example.

This discussion ended on an important but disquieting note: Whereas in past decades the U.S. was viewed by Europe as a security ally (in the Cold War era), it is now viewed as a commercial adversary – yet one on whose IT systems Europe is heavily dependent. As one participant put it: “Distrust and dependency is a dangerous combination.”

Overall, participants felt that this “dark side” discussion was an important contribution to the conference and raised issues that required continuing attention. The airing of views on Europe’s dependence on, yet distrust of, US-developed critical information system components was particularly valuable and could well be the most serious dark side issue raised during the conference.

11. Intellectual Property Rights in a Networked Economy

Discussion Leader and Rapporteur: Jonathan Cave

This section summarizes the discussion during the break-out session on intellectual property rights (IPR) in a networked economy. It begins with a consideration of the meaning and role of IPR, continues with a discussion of the specifics of a number of importantly different cases, describes a range of alternatives to IPR as currently implemented, and concludes with some policy recommendations and open issues.

What Are IPR and (Why) Do We Need Them?

Intellectual Property

Intellectual property (IP) is the intangible product of creative or intellectual effort. The use of the term "property" begs an important set of related questions: can or should such products be owned and, if so, by whom? Are they or should they be tradable? In the abstract, such products can be either direct (e.g., the writings of a scholar) or indirect (the applications of ideas or the reputation of the scholar). These issues will be touched on in what follows.

Intellectual products can take all the forms of information or knowledge, and more besides; they can reside explicitly – in the human mind, the shared understanding of a group, specific expressions or descriptions, relationships or organizational forms, processes, etc. – and they can be implicitly embedded in goods or services. They can be conceived in their actuality or their potential, as stocks or flows and as inputs or catalysts. To indicate this range of possibilities, we sometimes speak of intellectual (or relational, etc.) *capital* – this term includes many concepts, but excludes others (particularly the non-economic dimensions).

What Are IPR?

Property rights are legal artifacts that permit *ownership* and (sometimes) *trade* – the exchange of rights for rights, money, or other consideration. The rights need to be fixed to something tangible, observable or verifiable by the parties concerned in order to permit enforcement. The concept of ownership *bundles* many related “rights” – in the context of IPR, these include the rights to direct the use of IP, claim the fruits of IP exploitation, give away, destroy, etc. In some cases, IPR recognize these directly (as in the Continental concept of “neighboring rights”).

Usual IPR regimes are aimed at markets and distinguish literary property (which is consumed and afforded passive,³⁹ very narrow, durable protection on a global basis) from industrial property (used as an input and afforded active, broader, briefer protection by national or (in limited cases) multinational authorities. These categories may be interpreted in different ways or further subdivided. For instance, the US (and to some extent UK) views *copyright* (protection for literary property, fixed in a specific physical expression or “writing”) as an economic right that can be owned by individuals or groups, transferred, etc. By contrast, the prevailing Continental view is that copyright is a *moral right* (*droit morale* or *droit d’auteur*) inalienably vested in a single human person (the author).⁴⁰ Industrial property protection differentiates patents, designs, trademarks, etc. The divergent views point to possible obstacles to resolving globalization’s challenges to IPR, while the second suggests alternative solutions reflecting a simple reclassification of a specific type of material (e.g., seeking copyright rather than patent protection for software, protecting domain names as marks, etc. Property rights vary as to depth (whether they extend to derivative products), breadth (whether they extend to similar products) and duration. World IPR systems tend to define these implicitly or explicitly; to the extent that these one-size-fits-all systems are inappropriate, we may need to reconsider the applicability of the system or reallocate enforcement efforts.

What defines the “right” level of protection? The answer depends on the specifics of the property, the size and incidence of enforcement costs and the purposes for which rights were defined in the first place. Like the markets they support, IPR are only a mechanism and should be judged by the same operational and ideological standards as other mechanisms. We need to take

³⁹ Passive in the sense that the rights-holder need not register the property or otherwise claim the right.

⁴⁰ This oversimplifies; there are at least three quite distinct views of copyright and a wide range of hybrids.

account of such factors as the time and effort required to develop the product (or "innovation"), the risk taken, the time between the idea and the marketing of its application, the market lifetime necessary to recoup costs, etc. In addition, we need to consider the *efficiency* and *equity* of the distribution of benefits and costs. Even a purely economic conception of IPR has an ethical dimension: the fairness of the division of the spoils.

The extent and enforcement of IPR influence their incentive and informational properties and the harm associated with violations. The incentive and informational effects are mentioned below. The harm associated with IPR violation differs from that associated with violation of other property rights: for instance, if A makes an illegal copy of B's IP, B retains the original. B may have lost the revenue associated with a potential sale to A, but only if A would have bought a legitimate copy. Likewise, if A transfers (gives away or sells) the stolen copy, the harm to B depends on whether the recipients would have bought legitimate copies, and not on whether A makes money from the transfer.

Recent technological changes have raised the cost and lowered the effectiveness of IPR enforcement. It was noted during the discussion that from the economic point of view, IPR differs from security in that widespread (but not universal) copying may provide creators with an adequate return, whereas a few well-publicized violations may jeopardize public perceptions of security.

IPR Trades and Markets

Will private decisions lead to optimal outcomes? This depends on *externalities* – whether decisions take account of all consequences of economic effort. Some ideas are *non-rivalrous* public goods: use by one person does not affect their availability for use by others. Others offer *positive* (e.g., network) externalities: use by each enhances the welfare of all. By contrast, exclusive property rights create *negative* externalities – one person or group "owns" the idea at a time. This affects the "right" amount of intellectual effort and the way we compensate those who provide the effort.⁴¹ Optimal IP maximizes the difference between social benefit and social cost – typically, where *marginal* social benefit equals *marginal* social cost. Marginal social benefit of rivalrous "private" goods is measured by adding up quantities: efficient allocation (e.g., by means of a competitive market) gives each user the same marginal benefit. A public good, by contrast, is "enjoyed" simply for its existence: each person has access to the same amount,

⁴¹ It has been noted that this effort is socially valuable in its own right, regardless of whether it results in intellectual property *per se*.

but values it differently. This is consistent with, for example, a patronage model, in which IP workers are paid for their effort or through grants.

Markets accomplish a variety of functions. Chief among these are the provision of incentives (encouraging the right amount of creative effort), signaling (whereby users indicate their preferences for intellectual products), payment (compensating producers for costly effort and risk-bearing) and reputations (whereby quality is detected and revealed). Market outcomes are allocationally efficient if marginal social costs and benefits are equal, and productively efficient if average costs are minimized. IPR create a form of (temporary) monopoly or (in the case of licensing) oligopoly. The results include: a trade-off between equity (access by all, just return to all creative endeavor, allocation of returns between creators, distributors, marketers, etc.) and efficiency, a tension between the interests of promoters (high prices) and creators (wide distribution), and dead-weight loss of market power.

Some Specific Cases

Music

The discussion of IPR in the area of music touched on a range of issues. The group questioned whether the existing IPR regime fostered the interests of music creators/performers or producers/distributors, and the related issue of whether it subsidized some distribution technologies at the expense of potentially superior alternatives.

Another issue concerned the effect of technologies such as gnutella and Napster. The group felt that these (particularly those without designated servers) were potentially transforming technologies, redistributing profits and removing some economies of scale. It was recognized that studio resources used to develop and improve multimedia offerings might dwindle, that political and strategic reactions might create further dead-weight loss and that one effect was to increase revenues of telecommunications companies (often beyond the level associated with download of authorized content due to undependable connections).

It was noted that music differs from other areas in having many small users, calling into question the cost-effectiveness of conventional IPR enforcement.

Diversity was regarded as critically important. As noted by Rosen (1981), situations in which a few providers can meet the needs of the whole market

display a tendency towards "superstar equilibria," with disproportionate profits for a few players and variety restricted by Hotelling-like "clustering." Gnutella/Napster technologies remove rents but do not by themselves increase the scope of new content on offer.

Alternatives to large studios with extensive IPR portfolios could be seen in collecting societies, which are closer to the creators and performers, and may offer more flexible matching of incentives and efficiency.

Games

Video games are typically very expensive to produce. Piracy is seen as a serious impediment to development in the sector in terms of fair return and variety, implied entry barriers, and the effects of technological attempts to defend against infringement.

Academic and Cultural Literature

Academic literature could be regarded as a case where the creator's interest was identified with the moral right to claim authorship, while the economic returns to distribution rewarded publishers. Society's interest depended on wide distribution of high-quality output, coupled with incentives fostering creative effort and exchange of ideas. Recent technology changes such as electronic publishing foster wide access to higher bandwidth material than paper journals allow, but the issue is not a simple opposition of publishers' and authors' (and society's) interests. Filtration (separating good literature from bad, providing guidance to authors) is an important societal service that cannot be supported by *droit d'auteur* alone. It was also noted that while most uses of scholarly literature are individually small, libraries can serve as a third party large enough to facilitate rights transfer and bear vicarious liability.

Software

In the area of computer software, the group discussed the salience of various forms of IP protection including copyright, patent, secrecy, lead-time and technology. Recent changes in the nature of market transactions from effective ownership to licensing were discussed. In fact, all software sales have been licenses in order to facilitate restrictions on redistribution, etc.; recent innovations attempt to transfer version control back to suppliers, clarifying the position of software as a stream of services. The group also discussed the Microsoft case,

highlighting the way returns are pursued through a number of linked markets (OS->services->applications) and non-market compulsion (OEM agreements). Implications for future innovation and market efficiency and equity were also discussed.

Biotechnology

Issues in the areas of biotechnology and bioinformatics were extensively discussed. One was the recent patent on the sale of a single color (yellow) from among the many colors of Mexican beans; this was regarded as a *reductio ad absurdum* of the tendency to patent "anything made by the hand of man," and in particular the tendency to patent business processes. The group noted the contrast between software and genetic products in terms of whether IPR could or should be fixed on: the language used for expressing ideas, the ideas themselves, or applications. The group also noted the tendency of IPR to foster "enclosure" of resources previously held as commons, especially biogenetic heritage as shown by the 1989 basmati rice patent. The contribution of science and the need to provide incentives for further advances were noted but so were adverse effects of overly broad or unfair protection. These include chilling the development of derivative products, equity aspects associated with genetic heritage (including biodiversity), and the possibility that granting *ex situ* exploitation rights might remove potential incentives for native populations to preserve fragile ecosystems by denying their access to sustainable means of exploitation.

Another biotechnology issue concerned low-cost access by poor countries to patented drugs. In the context of the recent South African case, it was noted that rights were granted as a result of two convergent forces: the moral pressure exerted by national governments including those of countries with very profitable markets (e.g., Germany); and the "halo effect" of market rewards for ethical activity.

Finally, the group noted that IPR are always tied to something tangibly transacted in markets. Some perverse incentives can be corrected by changing the associated business model, as in Pfizer's decision to establish "health centers" for five specific conditions. According to this model, the company derives its revenue indirectly from cost savings associated with better management of those conditions rather than directly through sales of drugs.

Alternatives

The group also considered various alternatives or supplements to the current system (comprising both the definition and enforcement of rights). These included the following:

- To improve the coordination of IPR payments, transaction costs, user benefits and necessary compensation, increasing use could be made of payments tied to individual payments rather than purchases (pay-to-play arrangements).
- Problems with re-use of copyright material could be mitigated by various technological fixes (e.g., systems that decrypt material for each use and re-encrypt it afterwards, or systems that gradually degrade successive copies). These systems could facilitate "pay for play" charging.
- Alternative business models relying on positive network externalities, such as free or subsidized copies to selected groups (price discrimination), could be developed.
- Alternative business models relying on interoperability advantages, such as free shareware/crippleware with associated (paid) "killer apps" (rights discrimination), or free distribution of basic human genome information combined with commercial exploitation of applications (whether pharmaceutical or informatic), could be developed.
- Greater reliance could be placed on secrecy or speed-to-market as alternatives to patent-based industrial property rights with their compelled disclosure.
- N-person contracts, in which a third party (such as an ISP or national health care service) will provide rights intermediation or monitoring services, perhaps encouraged by joint and several liabilities, could be employed.
- Information intermediation as exemplified by the current MIT initiative to distribute all coursework information for free – which has increased demand for tutorial services – could be employed.
- Collective ownership of specific rights could be adopted, for example, in the case of heritage materials that are collectively created over long periods of time, such as traditional knowledge or folklore.

Recommendations and Open Issues

The group did not arrive at detailed specific recommendations, but there was a general sense that the system was already changing in many ways. Much of this

reflects needed variation, so a useful contribution by public authorities could be to clearly articulate (and, as necessary, harmonize) the public interest *behind* the IPR regime rather than the legal details. This would provide legal clarity to both stakeholders and judiciary, while retaining maximum technological neutrality and flexibility.

The group recognized major U.S./EU differences as to the tradability of specific classes of IPR, and the reasonable trade-offs among economic and ethical interests.

Emerging issues where some proactive steps might be required include traditional knowledge, folklore, genetic heritage and some classes of “tacit knowledge” such as those embedded in organizational relations and languages.

Clearly, markets are changing throughout the new economy. Functions such as matching of demand and supply, signaling (as to what is desired or feasible), incentives for effort and information revelation, securing payment and accomplishing transfers are increasingly handled by a wider range of institutions. The group noted that libraries or other information intermediaries would play important roles in this transformation.

The group did feel that there were grounds for considering different approaches for IT and biotechnology.

The discussion concluded with an examination of some “blue-sky” issues. These included the increasing commoditization of personal information, raising the question of who owns personal information (including, say, purchase histories generated under loyalty card schemes or web activity (clickstream) data). In this case, the IPR issues must be integrated with issues of privacy⁴² and competition policy. Another issue was raised by the growing practice of solving massively parallel problems (e.g., the search for extraterrestrial intelligence or screening of potential anti-cancer drugs) through peer-to-peer computing; ownership of IPR in the fruits of such searches is an interesting question. A related question is raised by proposals to cite computer programs as co-authors on computation-intensive academic articles. Finally, the recent attempt to assert copyright over all emails passing through a commercial network was discussed.

⁴² Again, U.S./EU differences were noted.

Part IV.

Concluding Remarks

12. Policy Implications for Europe: Remarks by a Panel of Observers

**Observers: Carl Bildt, Sergei Kapitza,
Joan Majo, and Adrian Mears**

Rapporteurs: Tora Bikson and Richard Hundley

The last session of the conference involved a panel of senior conference participants who gave their reactions to the conference discussions, with an emphasis on the policy implications for Europe of the future envisaged by the conference participants.

The First Observer

The first observer reflected on the great burst of IT-based innovation that has occurred in Scandinavia, most notably in Sweden and Finland, during the 1990s.⁴³ He asked, rhetorically, how did this suddenly happen? And are there any lessons from this Scandinavian experience that may offer policy guidance to the rest of Europe?

Answering this questions, the first observer began by noting that:

- The recession of the early 1990s was much deeper in Sweden and Finland than anywhere else in Europe. This forced them to find a new basis for their economic prosperity.
- These two countries moved to deregulation of telecommunications in the early 1990s, earlier than any other nations in Europe. This, together with the arrival of the World Wide Web in 1994-1995, created opportunities for a new breed of entrepreneurs.
- These two countries gave the earliest European support to the Global System for Mobile Communications (GSM) mobile telephone standard.

⁴³ He termed this the "Northern Light over the New Economy in Europe."

- These two countries joined the European Union in 1995, opening themselves up to a much larger market.

In Western Europe, only Sweden and Finland had this same combination of external changes and internal reforms during the 1990s. Suddenly, this was the hottest and most open market in the world for the new technology of mobile digital telephones. This observer believes this eventuated in creative destruction – or, as he put it, first the destruction, then the creation – that resulted in Sweden's and Finland's current position in the vanguard of the information revolution.

He noted that Sweden had been a country of big companies. In the IT era, it began also to generate small enterprises (e.g., web design firms, technical consultancies, etc.).⁴⁴

He described Sweden and Finland as being the “mobility pioneers” and “champions” of the 2nd generation (mobile telephone) information age.⁴⁵ It remains to be seen, in his view, who will be the champions of the coming 3rd generation age.

Viewed more broadly, he identified the following four items as the secrets of success for a nation in the information age:

- Bandwidth per capita.
- Venture capital as a proportion of GDP. (He noted that Sweden and Finland need to improve on this measure, as does much of the rest of Europe.)
- A competitive environment (i.e., open markets and deregulation) as a force for change.
- A quality education for all.

The policy implications here for Europe are obvious.

The Second Observer

The second observer announced his intention to orient his remarks around “culture,” which he distinguishes from information and knowledge, on the one hand, and civilization on the other. He groups (basic) science with culture.

⁴⁴ For example, in late 1994 the first Web consultancies in the world saw the light of day in Sweden.

⁴⁵ He noted in particular the role played by Ericsson and Nokia.

In his view, civilization and culture flourish together in Europe. Language is the carrier of information, but language is also the lens for looking at culture. Information, and even knowledge, are not creative; they are not implemented without culture.

Europe is the source of modern science. Currently he feels there is an unfortunate gap between science and society. Europe should face this and deal with it, through interdisciplinary research and through helping scientists learn to speak to society. He believes Europe may do better in closing this gap than others will.

He also believes that education will be the hub of the new knowledge society, critical to economic success. Accordingly, education policies must be part of the grand design for the information society and the new economy. He views education as the strongest source for fundamental research, which is the foundation for future advances in IT. Innovation, in contrast, has to do with implementing the results of science in society. In his view, Europe is probably better at fundamental research while the US is better in innovation. Japan and China, in contrast, are strongest in applied research. It is important to continue policies that promote the exchange of science students across the world. This boosts their intellectual and cultural creativity, and will be a significant contribution to the further development of the information society.

He feels that much can be done to expand the mechanisms of international collaboration in Europe. In this regard, he noted that the former republics of the Soviet Union thought that they would be embraced by Europe. Except for the Baltic states, this has not happened; the former Soviet republics feel lost.

He also noted that entrepreneurship is very important in the information age. Today, in his view, Russia is weak in entrepreneurship, Europe is somewhat better off, and the U.S. is very strong. Nevertheless, Europe has an important role to play in the development of the information revolution. In particular, Europe can be an example for the rest of the world in emphasizing the quality of life (civilization and culture) in the information society.

The Third Observer

Referring back to comments made by the first observer, the third observer stated that two important factors can form the basis for the future course of the information revolution in Europe:

- Bandwidth for all.

- Education for all.

He discussed each of these in turn.

Bandwidth

In his view, there is good news and bad news regarding the liberalization of telecommunications in Europe. The good news is that the liberalization process is almost complete in a legal sense: all of the required legal and regulatory framework is in place. But the bad news is that thus far it doesn't really work: the markets are not yet fully liberalized; it is still hard to overcome the influence of incumbent monopoly providers; and the costs of entry into network markets by new players are prohibitive.

He feels that the EU made a big mistake in 1994 by accepting the vertical integration of network operators with service providers; this, in his view, was *not* a good idea. Europe should have focused instead on the separation of network operations from services and the liberalization of services; this would have been a better solution, in his view, for commercial applications.

Second-generation GSM has been great, in his view – a “killer app” that responds to real needs. On the other hand, he believes third-generation GSM to be in a chaotic state: it is unclear whether any of the current business forecasts that associate third-generation GSM with the Internet are feasible, let alone credible. European governments' desires to make money by auctioning third-generation GSM licenses have produced a financial crisis in the European telecommunications industry. He is not convinced that anybody needs third-generation GSM as it is currently envisioned.

The upshot in his view is that there is a lot of bandwidth available in Europe but it is not useful (so there is bandwidth but it's not “for all,” in the sense that it is not useful for all).⁴⁶ It would be better, he feels, to have an integrated common infrastructure (i.e., network) used by different competitive service providers. This infrastructure should be single and common, just like standards, and for similar reasons.

⁴⁶ He noted in passing that on the main streets in Barcelona, there are today seven parallel fiber optic cables, installed by seven competing companies.

Education

The third observer believes it is crucial to understand how the information revolution can and the information society should change the content of education. He noted that most discussion to date has focused on IT as a way of changing the methods of education, not the content.

What is needed, in his view, is to revolutionize education, because the life cycle of knowledge is shorter than the cycle of life per se. So individuals will need to be educated many times over – we will have to have continuous knowledge learning. Moreover, we have to avoid early specialization and compartmentalization in favor of education that stresses fundamentals, breadth, and multidisciplinary interaction. As a result, there is a need to invest a lot in education and in educators (and not in computers only).

He believes there should be national education policies in this regard, but that the EU should take the lead in encouraging such policies.

Policy Implications

He concluded with two specific policy proposals:

- Europe should have one common infrastructure for third-generation GSM. There should be competition on the services delivered over this network infrastructure, not competition between networks.
- In educating its population for life in the information age, Europe should invest its money on educators, not on computers.

Finally, returning to his opening comments, he stated that Europe must invest a great deal of money in coming years in bandwidth and in quality education.

The Fourth Observer

The fourth observer took his starting point from Einstein's contention that "It's not what you know, it's knowing what you don't need to know" that is critical. He would like to arrive (in his remarks) at some simple key points, by asking what will be the grist – the critical levers for change – in the information revolution.

A good start, in his view, can be achieved by looking at needs that will likely persist. For instance, education and health care will be persistent needs. But he does not feel we are doing very well today with innovation in these big areas of

need, so policy should aim to stimulate such innovation. He listed other big need areas as:

- intelligent environment
- amplifiers for human senses
- cybercafes in developing countries
- unicasting services tailored to a specific individual at a particular time
- better ways of representing and expressing information
- robots to perform undesirable tasks
- support for the needs of elderly and young workers
- productivity improvement
- sustainability – this is a very important issue in Europe

Thus there are in his view many opportunities to serve basic needs with IT. Europe should make sure it moves into these areas. (In contrast, he agreed with prior speakers about third-generation GSM. “What’s it for?” he asked; “who needs it?”)

He also noted that, in the UK at least, there is great concern that Europe trails the U.S. in productivity. At this point in time, when the Internet bubble has just burst, there may be an opportunity for Europe to catch up. Improving European productivity through the use of IT is one available option.

He noted two kinds of key constraints on the information revolution. First, he cited social, ethical and human issues, standards, and monopoly powers (e.g., Microsoft) as constraints on IT progress. There will be debates in each of these areas about what is acceptable and desirable. Second, there is the question of how to engage flexibly in creative destruction – how can society continue coupling, decoupling, and recoupling to generate innovative activity? He views this as a major challenge.

He predicts that networked society will *not* lead to a rebirth of communitarian socialism. Instead, he believes it will enable greater individual self-actualization.⁴⁷

Finally, regarding the “dark side” of the information revolution, he noted that systems at a certain level of complexity have emergent properties, some of which

⁴⁷ This was a reference to the presentation on a “global sustainable society” at the plenary session on the social dimension of the information revolution.

can be highly damaging. As systems become more and more complex we need to develop ways of understanding their emergent properties. This certainly applies to the information revolution and the information society.

The fourth observer concluded his remarks by suggesting that technological progress toward an information society could be represented by means of the two-dimensional space illustrated in Figure 12.1.

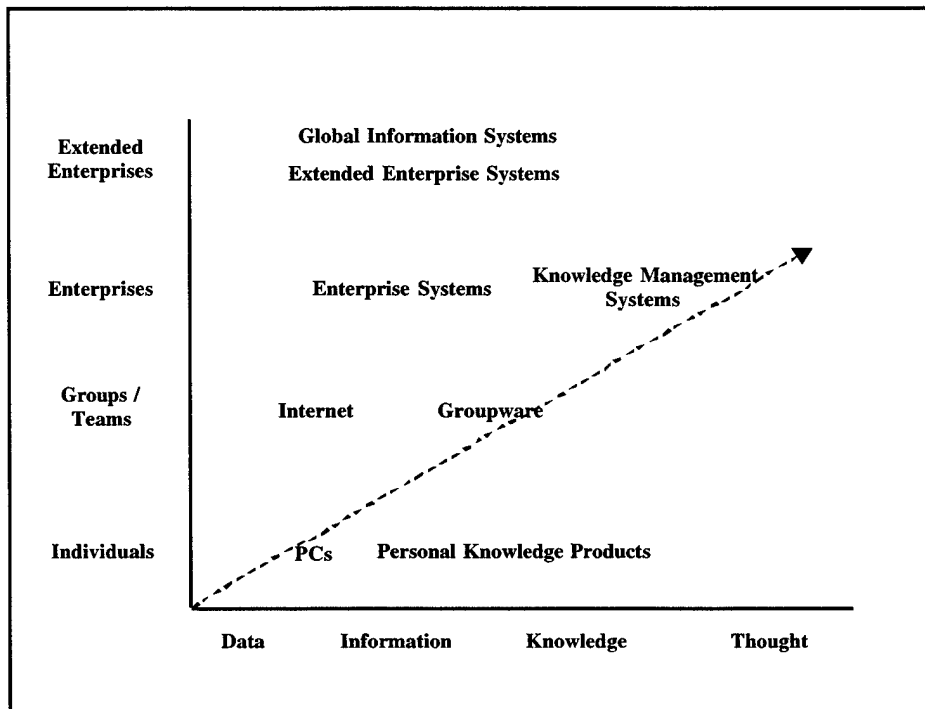


Figure 12.1 Technological Progress toward an Information Society

In this figure, the ordinate represents increasingly complex social entities, where "extended enterprises" include not only geographically distributed organizations but also networks of disparate organizations that jointly constitute supply chains. The abscissa, in contrast, represents increasingly complex cognitive constructs that might be supported or enhanced by information technologies; the area above "thought" is sparse at present because few technologies have emerged to support it.

According to the fourth observer, the line shown beginning at the origin and going towards the upper right-hand corner of the figure comes close to mapping the emergence of the information society, with technologies over time evolving from the lower left to the upper right quadrants of the space. He challenged conference participants to envision the technologies that would, in the future,

populate the right-hand half of this space – especially technologies addressing the needs of highly complex enterprises such as those involved in health care delivery or education.

13. Some Post-Conference Observations

**Richard O. Hundley, Robert H. Anderson,
Tora K. Bikson, and C. Richard Neu**

The purpose of this conference was two-fold:

- To expose the somewhat American-centric picture of the information revolution developed during previous conferences in the RAND information revolution series to an informed European audience.
- By so doing, to thereby broaden and deepen our understanding of the future course of the information revolution in Europe and elsewhere in the world.

The conference generated a rich set of observations furthering both of these objectives. Here we highlight differing European and American perspectives and approaches regarding the information revolution, take note of other pervasive or otherwise notable themes that arose during the conference, identify some topics that merit further discussion or investigation, and finish with a brief mention of what we expect will come next in RAND's information revolution project.

Differing European and American Perspectives and Approaches

One of the overarching themes that pervaded much of the conference discussion had to do with differing European and American perspectives on and approaches to the information revolution. The most important of these differing perspectives and approaches appear to be the following:

Differing European and American Approaches to Economic and Social Change

Economic and social change seems to come easier in America than in Europe, sometimes much easier. This was repeatedly emphasized during the conference

discussions. As individuals, Europeans are on average much more risk-adverse than are Americans when it comes to economic change.⁴⁸ As a society, Europe is generally distrustful of major economic or social changes.⁴⁹ As a result, many more obstacles to change have arisen in Europe than in America.

Since substantial change in the patterns of economic activity is required to take full advantage of the new information technologies, with new companies arising and some old companies falling by the wayside, with new jobs appearing on the scene and some old jobs disappearing, the differing European and American attitudes towards such change could be quite consequential. The relative difficulty of such change in Europe could cause it to follow a noticeably different course towards the information society and the new economy than that followed in the United States. In particular, as noted several times during the conference, the process of "creative destruction" by which new technologies and business paradigms replace their predecessors as the information revolution progresses is likely to proceed more slowly in Europe than in the United States.

The Greater Importance Europeans Attach to Economic and Social Equity

Another key difference between Europe and America emphasized in the conference discussions was the relative importance attached to economic and social equity on the one hand and economic efficiency on the other. Europeans place a much greater value on equality of outcomes than do Americans,⁵⁰ looking for win-win applications of information technology which allow everyone to be better off. This greater European concern for economic and social equity may not be consistent with the large rewards often associated with successful risk-taking in a dynamic information technology sector.

Americans, on the other hand, are much more willing to accept trade-offs involving benefits for some groups against losses for other groups. This American approach is likely to result in a more aggressive pursuit of new technologies.

⁴⁸ In a recent article, Levine (2001) describes the American approach to economic change as emphasizing ambition over security, saying: "For many Americans – particularly the most competent – the hope of getting rich is a more compelling incentive than the fear of becoming poor."

⁴⁹ One of the conference participants noted during the discussions, as one example of this: "When a new technology opportunity or economic arrangement manifests itself, the U.S. approach is to try it out and see what happens; the European approach is to first assess the consequences, before trying it out."

⁵⁰ Americans place a high value on "equal opportunity," rather than on "equal outcomes."

These equity-versus-efficiency differences are another reason that Europe may follow a different course towards the information society and the new economy than that followed in the United States.

The European Desire for "Convergence"

Closely related to the European desire for economic and social equity is a desire for "convergence" among the countries of Europe, where by convergence is meant the reduction of differences in economic prosperity among the various European nations – including those not yet admitted to the European Union.⁵¹ No one at the conference questioned the political value of efforts to reduce gaps in the prosperity of different European countries, but some wondered if pursuit of such objectives is consistent with full exploitation of the opportunities afforded by the new information technologies.

This is another area where America clearly differs from Europe. Most American states don't want to "converge" with other states; they want to get ahead of those states.

Differing Trade-Offs between Market Forces and Government Policies

The thematic tension between market forces and government policies was a recurring theme during the conference. Europe and America take differing approaches to balancing these factors: the U.S. gives market forces more of a free rein; Europe leans harder on government policy to produce socially desirable ends.⁵²

Greater European Emphasis on Top-Down Planning

Closely related to this is a greater European emphasis on top-down planning, by governmental and business elites (often working in close conjunction), both on a national basis and by the EU.⁵³

⁵¹ It is not clear if convergence is an European-wide desire, or primarily an EU desire.

⁵² This is clearly related to the U.S. emphasis on economic efficiency versus the European emphasis on economic and social equity.

⁵³ It is somewhat ironic that many multinational companies have abandoned "five-year plans" as being hopelessly outdated, and use something like a six-month planning horizon for many decisions instead, whereas the EU apparently believes it can do quite specific policy planning over much longer time horizons.

The U.S. relies much more on bottom-up, market-driven, private-sector planning, with the government role limited to preparing the "playing field" and "ground rules" for competition and innovation, but not trying to second-guess where the breakthroughs and developments will occur.

The European Emphasis on "Sustainability"

A recurring theme among the European participants in the conference was the question of "sustainability": whether the information revolution will hinder or enhance sustainable – in economic and environmental terms – development. No consensus was reached on this question. Nevertheless, the European participants attached considerable importance to achieving sustainable development. They acknowledged, however, that such a future is unlikely to come about without significant intervention by governments and other agents of social change.

This appeared to the American participants to be almost exclusively a European concern; sustainability certainly is not a major concern today in America.⁵⁴

Will, or Must, Europe Become More Like America?

Given all of these differences between Europe and America, what does the future hold? Driven by the forces of the information revolution and globalization, will Europe become more like America? In order to succeed in the information age, must Europe become more like America? There was no consensus on these questions among the conference participants, European or American.

Some participants – notably some European participants – felt that although Europe is and will likely remain attached to the ideals of social equity and inter-European convergence, influences already afoot will inevitably make Europe more like America: more tolerant of disparities in income and wealth within nations and more realistic about the fact that all nations cannot achieve similar rates of economic development. The completion of the European market will increase competition within Europe. The EU Stability Pact will limit government deficits, and competition for employment and investment will restrain taxation. EU enlargement will only heighten this competition. Similarly, adoption of a common currency will speed the integration of European financial markets and intensify competition for investment.

⁵⁴ This was the first time the topic of "sustainability" has come up in the RAND series of international conferences on the information revolution.

In this view, the result of these forces will be to limit the capacity of European governments to pursue social equality. Although European governments will remain "officially" committed to equality of outcome among their citizens, the "reality" will be increasingly laissez-faire policies that will accelerate the incentives for and the increase the rewards of successful exploitation of information technology. In short, Europe will become more like America.⁵⁵

Other participants strongly rejected this view, warning against generalizations that suggest that Europe shares a single approach to preserving social equity. In fact, they said, there are many social-economic models within Europe, and some of them, at least, will prove able to withstand the American challenge. In their view, Europe will be able to maintain its cherished differences.

Other Pervasive or Notable Themes

Other pervasive or otherwise notable themes that arose during the conference included the following:

Europe's Recent Emphasis on Wireless

Europe's current lead in wireless technologies received considerable emphasis during the conference. Many Europeans are counting on this to give Europe an edge in the next set of information society developments. Whether this will turn out to be true remains to be seen, particularly in view of the market uncertainties and financial difficulties currently facing the leading European wireless/telecommunications companies. These uncertainties and difficulties also received considerable emphasis during the conference.⁵⁶

The Secrets of Success for a Nation in the Information Age

One of the conference participants highlighted four items as the secrets of success for a nation in the information age:

⁵⁵ As an extension of this view, some participants pointed out that the generation that will do the most to shape the course of the information revolution in Europe – today's young people – was not represented at this conference. Conference participants, they asserted, know little about the attitudes of young people towards information technology, work, or society. They speculated that members of the younger generation of Europeans will become (or already are) more like their American contemporaries than their elders are or will be.

⁵⁶ Simply put, the market projections for third-generation mobile telephony (so-called 3G) may be considerably overblown, and the European telecommunications companies may have paid way too much for their 3G licenses. Only time will tell.

- Bandwidth per capita.
- Venture capital as a proportion of GDP.
- A competitive environment (i.e., open markets and deregulation) as a force for change.
- A quality education for all.

The predictive implications here, not only for Europe but for all other nations as well, are obvious.⁵⁷

U.S. Dominance of the Information Revolution

The U.S. dominance of the information revolution, thus far, was brought up frequently during the conference. Evidences of this dominance cited (and sometimes complained about) by European participants included U.S. control of the development of the Internet, the procedures for assignment of Internet domain names, and Hollywood's dominance of film and television entertainment, with its impact on European and other non-U.S. cultures.

Issues of Trust and Dependence

Directly related to this U.S. dominance were issues of trust in and dependence on the U.S. – in European eyes, too much trust and dependence. According to conference participants, many Europeans are worried about their increasing need to trust information systems built (or integrated) in the United States (e.g., by Microsoft, Intel, Cisco, etc.), on which their business and governmental operations and critical infrastructures depend. Europeans wonder if deliberate security “back doors” or flaws are built into these U.S.-supplied information systems to facilitate U.S. commercial intelligence collection.⁵⁸

Whereas during the Cold War era the U.S. was viewed by Europe as a security ally, it is now viewed increasingly as a commercial adversary – yet one on whose IT systems Europe is heavily dependent. As one conference participant put it: “Distrust and dependency is a dangerous combination.”

⁵⁷ Conference participants generally were interested in defining a set of indicators that would have long-term predictive value. A logical next step, could that be done, would be to start gathering prospective indicator data on factors such as these (partly for mapping the course of the information revolution and partly for testing their predictive validity).

⁵⁸ Recent European Parliament and media attention focused on a supposed U.S. National Security Agency-led “Echelon” system allegedly used to spy on European communications has contributed to this distrust of U.S. systems.

Because of these trust and dependency issues, many Europeans view the U.S. as part of the "dark side" of the information revolution.⁵⁹ This could have important implications for future U.S.-European relations.

Topics That Merit Further Discussion or Investigation

The conference covered a lot of ground, but it did not cover everything. Among topics that merit further discussion or investigation, by the NIC or others, are the following:

Variations across Europe

Going into the conference, the RAND organizers hoped to use it to develop a better picture of likely variations in the course of the information revolution across Europe. That was not to be. Beyond general statements regarding north-south variations across Europe in the penetration rates of information technology and east-west variations with respect to banking systems, availability of credit, the role of black/gray economies, and other economic factors, the conference participants shied away from specific discussion of how various nations or regions in Europe may proceed along different paths or at different speeds towards the information society.

This reluctance to discuss likely variations across Europe may be a manifestation of the European desire, noted earlier, for convergence in an economic sense across at least the EU nations, if not across all of Europe. Be that as it may, national/regional variations regarding the course of the information revolution clearly exist today in Europe. Outside observers would say that they are likely to persist well into the future.⁶⁰ This is clearly a topic meriting further investigation.

The European View of the U.S. As Part of the "Dark Side"

The European view of the U.S. as part of the "dark side" of the information revolution, noted earlier, came as a surprise to most of the American participants in the conference. If this view is as widely held within Europe as indicated at the

⁵⁹ This surprised many/most of the U.S. attendees at the conference. It was probably the biggest surprise they had during the entire conference.

⁶⁰ On a related topic, for example, a recent International Monetary Fund Working Paper showed that convergence of some of the EU accession states and other eastern European nations to the European economic "norm" could take several decades. (See Kolodko, 2000.)

conference, it could have tremendous effect on future U.S.-European relations. This is something the NIC needs to explore in great depth, to see, for example, if this feeling is held by others throughout the rest of the world.

The Secrets of Success for a Nation in the Information Age

Two of the items cited during the conference as the secrets of success for a nation in the information age, "bandwidth per capita" and "venture capital as a fraction of GDP," can be quantitatively measured in a relatively straightforward fashion. Generating quantitative time-series data on these two factors for nations throughout the world could be of considerable interest and predictive utility.⁶¹

Privacy

Several conference participants expressed the view that threats to privacy constitute a "time bomb" for businesses seeking to utilize new information technologies. They noted serious differences between America and Europe over citizens' rights to privacy and over what constitutes adequate protection of these rights. Since the seamless nature of the information environment will eventually force American and European users of new technologies to adopt common standards, further discussion and investigation of this issue is clearly warranted.

The Views of Younger Europeans

What do young Europeans think of all this? Since today's young people are the generation that will do the most to shape the course of the information revolution in Europe, and they were not represented at this conference, this is something to think about. If university and secondary students had been involved in the conference, some interesting alternative views might have surfaced.

The Views of Non-EU Europeans

Although the original intent was to have a balanced representation at the conference from all across Europe (i.e., to the Urals), most of the participants

⁶¹ Paying particular attention to 3G mobile as a potential source of future bandwidth for all could be of special interest, especially given the controversial projections – discussed earlier in this section – about what it will or will not contribute to the information revolution.

came from EU nations.⁶² Central and eastern Europeans were substantially under represented.⁶³ It would be interesting to know to what extent their views on the many topics discussed at the conference differ from those of EU member nations.

A Number of Specific Economic and Business Topics

A number of other economic and business topics also merit more discussion than time permitted during the conference:

How does change (mostly technological and economic) come about?

Conference participants never really came to grips with views about what drives change, how government can or should promote or retard change, the roles of universities, business schools, "experts," visionaries, planners, entrepreneurs, etc. Neither did they ask whether the process of technological and economic change has itself changed in any significant way with the arrival of new information technologies.

The role of European (or traditionally Europe-based) companies in the global economy. The conference did not discuss whether what some people recognize as European companies are seeking aggressively to expand into other markets or whether they are succeeding. Whatever the facts are, why? Are European companies constrained in particular ways? The obverse is whether Europe has proven fertile territory for firms that have not previously operated there. And does any of this matter?

European financial markets. Several participants noted that European financial markets are inferior to American markets, raising the costs of routine business transactions and restricting the availability of capital for certain high-tech and high-tech-using ventures. But participants never really went into the nature of these differences, described in detail their consequences, or asked what it would take to improve the European financial system.

Tax and regulatory policies. Besides the general observations that European taxes tend to be higher than American taxes and regulatory structures more onerous, participants never really talked about what taxes or what regulations are particularly debilitating for IT development and exploitation, how these taxes and regulations are affecting the rate and character of European IT adoption, or

⁶² Switzerland was the only non-EU nation with sizable representation at the conference.

⁶³ By "central Europe" we mean the non-Soviet member states of the former Warsaw Pact. By "eastern Europe" we mean the European states of the former Soviet Union.

what changes in European tax and regulatory policies are most pressingly needed.

Europe's growth prospects. The conference discussions were never explicit about how IT is changing Europe's growth prospects, how IT may affect Europe's economic position relative to the United States or Asia, and what difference this would make. Neither did the participants identify specific industries that would flourish in Europe (either absolutely or relatively) as a consequence of IT advances, nor those industries that may be hurt.

The impact of defense spending. The conference did not discuss the effect of defense spending on IT development in Europe. Potentially interesting in this regard would be the consequences of European defense consolidation.

Corporate governance and ownership of shares. Few European households own equities today, but this share is starting to rise. Similarly, few European households manage retirement funds in the form of equities or mutual funds. Rules of corporate governance are different in Europe than in the United States, and cross-shareholding among corporations is more common in Europe than in the United States. The conference did not consider how these factors might affect the speed and character of IT adoption and utilization in Europe.

WTO and export controls. Neither did the conference consider how the continuing development of the WTO – new members, expansion to services, telecomms, application to investment, etc. – is affecting IT in Europe. Nor did it discuss how export controls imposed by the United States and being urged on Europe may influence the course of IT development.

What Comes Next

One additional conference is anticipated in the RAND/NIC series on the information revolution: a conference in Singapore in 2002 on the future course of the information revolution in the Asia Pacific region. In addition, RAND will participate in a NIC/State Department conference in October 2001 on the information revolution in Africa. Finally, RAND anticipates updating the IR country model paper published in January of this year,⁶⁴ incorporating everything we will have learned after all of the conferences are completed.

⁶⁴ See Hundley (2001).

Appendix

A. Conference Participants

- Dr. Robert H. Anderson (UNITED STATES)
Senior Information Scientist and Head, Information Sciences Group, RAND
- Mr. Neil Bailey (UNITED KINGDOM)
Managing Director, Empower Dynamics
- Dr. Tora Kay Bikson (UNITED STATES)
Senior Behavioral Scientist, RAND
- Dr. Carl Bildt (SWEDEN)
Special United Nations Envoy for the Balkans
Formerly Prime Minister of Sweden
Member, Advisory Board, RAND Europe
- Mr. Daniel Bircher (SWITZERLAND)
Head, Information and Process Security
Ernst Basler & Partners Ltd.
- Mr. Maarten Botterman (THE NETHERLANDS)
Program Director, Information and Communications Technology (ICT)
Policy Research, RAND Europe
- Mr. J. C. Burgelman (BELGIUM)
SMIT-VUB
- Dr. Gabriella Cattaneo (ITALY)
Databank Consulting
- Dr. Jonathan Cave (UNITED STATES)
Senior Economist, RAND Europe
- Mr. Anders Comstedt (SWEDEN)
President, Stokab
- Mr. Renée Cordes (BELGIUM)
Free Lance Journalist, Brussels

- Mr. Ian Culpin (BELGIUM)
Martech International, Brussels
- Ms. Carine Dartiguepeyrou (FRANCE)
Consultant, RAND Europe
Formerly of Solving International, Paris
- Ms. Kitty de Bruin (THE NETHERLANDS)
Director, NT FORUM
- Mr. Pol Descamps (BELGIUM)
Consultant, PTD Partners
- Mr. Job Dittberner (UNITED STATES)
National Intelligence Council
- Mr. Bob Ford (UNITED KINGDOM)
Senior R&D Manager
British Telecommunications (BT)
- Dr. Lawrence K. Gershwin (UNITED STATES)
National Intelligence Officer for Science & Technology,
National Intelligence Council
- Dr. Eugene C. Gritton (UNITED STATES)
Director, Acquisition and Technology Policy Program, RAND
- Mr. Kurt Haering (SWITZERLAND)
Director, Foundation InfoSurance, Zurich
- Dr. Kris Halvorsen (NORWAY)
Center Director, Solutions and Services Technologies
Hewlett Packard Laboratories
- Professor Dr. Bernhard M. Hämmerli (SWITZERLAND)
Professor of Informatics, Communications and Security
Applied University of Technology Lucerne
- Dr. Andrej Heinke (GERMANY)
Daimler Chrysler
- Dr. Richard O. Hundley (UNITED STATES)
Senior Physical Scientist and Manager, Information Revolution Project,
RAND

- Col. Eng. Aurelian Ionescu (ROMANIA)
CIO and IT Advisor to State Secretary,
Romania Ministry of National Defense, Bucharest
- Dr. Suzanne Jantsch (GERMANY)
Project Manager, Information Technology Communications, IABG
- Dr. Peter Johnston (UNITED KINGDOM)
Head of New Methods of Work, Information Society Directorate-General,
European Commission
- Professor Sergei Kapitza (RUSSIA)
Academy of Science, Moscow
- Mr. Thomas Koeppel (SWITZERLAND)
Section Head, Service for Analysis and Prevention, Swiss Federal Office
of Police, Bern
- Mr. Ivo Kreiliger (SWITZERLAND)
Deputy Intelligence Coordinator, Assessment and Detection Bureau, Bern
- Professor Eddie C. Y. Kuo (SINGAPORE)
Dean, School of Communication Studies
Nanyang Technological University, Singapore
- Mr. David Leever (UNITED KINGDOM)
VERS Associates
- Mr. Stephan Libiszewski (SWITZERLAND)
Attaché for IT, Swiss Mission to NATO, Brussels
- Dr. Erkki Liikanen (FINLAND)
Commissioner, Enterprise and Information Society, European Commission
- Professor Arun Mahizhan (SINGAPORE)
Deputy Director, Institute of Policy Studies, Singapore
- Dr. Joan Majo (SPAIN)
Institut Catalan de Technologia
- Dr. John McGrath, (RN retired) (UNITED KINGDOM)
Ex Dean, Royal Navy Engineering College, Manadon
- Dr. Adrian Mears (UNITED KINGDOM)
Technical Director
Defence Evaluation and Research Agency (DERA), Farnborough

- Mr. Horace Mitchell (UNITED KINGDOM)
 Founder and CEO, Management Technology Associates
- Dr. C. Richard Neu (UNITED STATES)
 Senior Economist, RAND
- Dr. Michelle Norgate (SWITZERLAND)
 Center For Security Studies And Conflict Research
 Swiss Federal Institute Of Technology, Zurich
- Sir Michael Palliser (UNITED KINGDOM)
 Chairman, Advisory Board, RAND Europe
 Former Vice Chairman, Samuel Montagu & Co., London
- Dr. Sarah Pearce (UNITED KINGDOM)
 Parliamentary Office of Science & Technology, London
- Mr. Ian Pearson (UNITED KINGDOM)
 Futurologist, BT Laboratories
- Dr. Robert Pestel (GERMANY)
 Senior Scientific Officer, Information Society Directorate-General
 European Commission
- Prof. Richard Potter (UNITED KINGDOM)
 Defence Evaluation and Research Agency (DERA), Farnborough
- Dr. Michel Saloff-Coste (FRANCE)
 MSC & Partners, Paris
- Mr. Maurice Sanciaume (FRANCE)
 Government Affairs Manager Europe
 Agilent Technologies Belgium
- Dr. Brian Shaw (UNITED STATES)
 Deputy National Intelligence Officer for Science & Technology,
 National Intelligence Council
- Mr. Mark Stead (UNITED KINGDOM)
 Member of the Director General Information office of the Ministry of Defence
- Mr. Eddie Stewart (UNITED KINGDOM)
 DERA Webmaster
 Defence Evaluation and Research Agency (DERA)

Professor Reima Suomi (FINLAND)

University of Turku, Finland

Ms. Pamela Taylor (UNITED KINGDOM)

E-Business Policy Advisor

Confederation of British Industry (CBI)

Mr. Tom Tesch (BELGIUM)

Technical University of West Flanders

Kortrijk, Belgium

Professor Paul Van Binst (BELGIUM)

Director, Telematics and Communications Services

Free University of Brussels

Mr. Lorenzo Veleri (UNITED KINGDOM)

Policy Analyst, Kings College, London

Mr. Phillip Webb (UNITED KINGDOM)

Chief Information Officer and Chief Knowledge Office

Defence Evaluation and Research Agency (DERA), Farnborough

Professor Raoul Weiler (BELGIUM)

University of Louvain

Dr. Walter Widmer (SWITZERLAND)

Head IT Security Switzerland, UBS

B. Conference Agenda

Wednesday, April 25

10:00 am to 11:15 am	Opening Plenary Session <ul style="list-style-type: none"> • Welcome to the Conference <ul style="list-style-type: none"> • Sir Michael Palliser (RAND and RAND Europe) • Dr. Lawrence Gershwin (NIC) • Dr. Adrian Mears (DERA) • Mr. Stephan Libiszewski (ISN) • Overview of RAND's Information Revolution Project and an Introduction to This Conference <ul style="list-style-type: none"> • Dr. Richard Hundley (RAND)
11:15 am to 11:30 am	Break
11:30 am to 1:00 pm	The Technology Dimension of the Information Revolution (Moderator: Mr. Phillip Webb, DERA) <ul style="list-style-type: none"> • What transpired in the virtual conference discussion track: a summary (Phillip Webb) • Followed by a structured discussion.
1:00 pm to 2:00 pm	Lunch
2:00 pm to 3:30 pm	The Economic and Business Dimension of the Information Revolution (Moderator: Dr. C. Richard Neu, RAND) <ul style="list-style-type: none"> • What transpired in the virtual conference discussion track: a summary. (C. Richard Neu) • Followed by a structured discussion.
3:30 pm to 4:00 pm	Break

Wednesday, April 25 (continued)

4:00 pm to 5:30 pm	The Social Dimension of the Information Revolution (Moderator: Dr. Richard Potter, DERA) <ul style="list-style-type: none"> • What transpired in the virtual conference discussion track: a summary. (Richard Potter) • Followed by a structured discussion.
5:30 pm to 7:00 pm	Free Time
7:00 pm to 9:00 pm	Conference Reception (Drinks and Dinner Buffet)

Thursday, April 26

8:30 am to 10:00 am	The Governmental and Political Dimension of the Information Revolution (Moderator: Dr. Peter Johnston, EC) <ul style="list-style-type: none"> • What transpired in the virtual conference discussion track: a summary. (Peter Johnston) • Followed by a structured discussion.
10:00 am to 11:00 am	Keynote Address <u>Dr. Erkki Liikanen</u> Commissioner for Enterprise and the Information Society, Commission of the European Union
11:00 am to 11:30 am	Break
11:30 am to 1:00 pm	The Security Dimension of the Information Revolution (Moderator: Mr. Thomas Koeppel, Swiss Federal Office of Police) <ul style="list-style-type: none"> • What transpired in the virtual conference discussion track: a summary (Thomas Koeppel) • Followed by a structured discussion.
1:00 pm to 2:00 pm	Lunch
2:00 pm to 2:15 pm	Introduction to Breakout Groups (Dr. Richard Hundley, RAND)

Thursday, April 26 (continued)

2:15 pm to 5:30 pm	Breakout Group Sessions On various crosscutting themes and issues
5:30 pm to 7:00 pm	Free Time
7:00 pm to 9:30 pm	Conference Banquet After Dinner Speaker Professor Paul Van Binst, Free University of Brussels <i>Information and Communication: Revolution, Decadence or Renaissance?</i>

Friday, April 27

9:00 am to 10:30 am	Report Back from the Breakout Groups (Moderator: Dr. Richard Hundley, RAND) Followed by comments from the audience
10:30 am to 11:00 am	Break
11:00 am to 1:00 pm	Closing Plenary Session (Moderator: Dr. Richard Hundley, RAND) <ul style="list-style-type: none"> Policy Implications for Europe: Remarks by a Panel of Observers Dr. Carl Bildt, Professor Sergei Kapitza, Dr. Joan Majo, and Dr. Adrian Mears A group of senior conference participants give their reactions to the conference discussions, with an emphasis on the policy implications for Europe of the future envisaged by the conference participants. Closing Comments By the conference research partners and sponsors.
1:00 pm to 2:00 pm	Lunch
2:00 pm	Conference Adjourns

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